

August 24, 1929

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AVIATION

The Oldest American Aeronautical Magazine



NATIONAL *Air Race* NUMBER

CLEVELAND SHOW FORECAST . . . STORY OF RACES . . .
Secretary Davison . . . Secretary Ingalls . . . Clarence M. Young
. . . Lieut. Doolittle . . . C. S. Jones . . . Capt. Goodman-Crouch
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Concerns even less their shadow before—and there is coming not only the new B/J plane but the new B/J sales plan and advertising, establishing for B/J plane a commanding position in the construction of assembled American. Built in a new quarter million dollar plant with every facility for high-quality, low-cost production, B/J plane will be "The Farmover of the Air" in mobility as well as in performance. Write to G. Roger Coons, Commercial Sales Manager, Berliner-Joyce Aircraft Corporation, Baltimore, Md., for address information about the B/J sales plan.

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The New Warner Engine

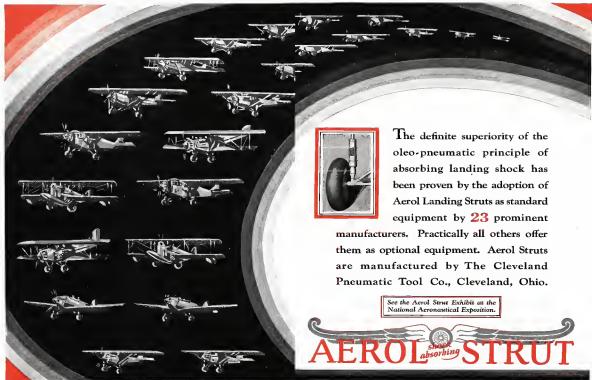
Smooth—compact. Instantly alert to the thumb's squeeze—that's the Argo. At 1000 ft. you develop speed, 125 miles per hour on, you can cruise at 300. And an acre of ground isn't necessary for either take off or landing.


Built in the same plant, with plane and New Warner engine perform in true unity as the pilot's bidding.

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Magneto are
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*They are selected because
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**Cleveland
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Representative Airport Operations, America's No. 1, recently purchased six Fairchild KR 34s with 100-hp engines, five new and one used, but another is to be added. These are just ready for student training and more. The sixth is in the picture.

D. J. BURRETT, Jr., of Wrentham Airport, believes in training students in modern ships. "The kind they will want to buy and you will want to sell," he says. And so, this summer, he switched to Fairchild KR 34s. In the first month's operation he has three regular Fairchild KR training clips had 107 hours, 68 hours and 45 hours respectively in the air. His third instruction clip has scarcely been needed.

"They are fine ships," says Mr. Burrett. "It took unusual for us to use them as long as a day for instruction. They handle well. The pilots like them. The students like them. Just use little point, for example. By twisting back only slightly you can fall between the cockpit without shaking."

"One great advantage for the operator in the three-place Fairchild KR 34 is that you can use these ships also for hops and taxi work. For this service, we simply remove the controls from the front cockpit and go. That doubles the value of the equipment without extra expense."

Let us tell you the whole story of the Fairchild KR 34 and other fine airplanes in this line. Write us for our catalog.

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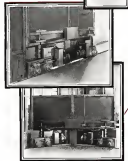
FAIRCHILD



KR AIRPLANES



At Pontiac one of the doors is an ELECTRIC LOCOMOTIVE



IT MOVES. At a touch of a button the door glides along the track, pushing a line of doors around the corner. It moves quietly, at an even speed, opening or closing the entrance in a mere fraction of the time required to do this "by hand."

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Controlled by foot-proof push buttons on the door itself, or by remote control located at any convenient point in hangar or office. Motorized to operate on your regular lighting or power circuit. Low operating cost.

Quick opening and closing is always an advantage, especially in cold weather. One man can now handle an entire entrance, saving time, labor, and money for you.

Let us submit full information and precise estimate. We can motorize your doors, no matter what type they may be!

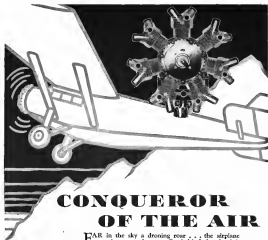


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Always behind this conquest will be found an industrial organization whose skill and experience have made possible this conquest and safety in the air.

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Continental Engines

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OWNING securities of 31 enterprises, the corporation gives to its stockholders a diversified investment in aviation based on sound research and analysis.

MANAGED by a Board of Directors of men outstanding in aviation and successful in other nationally known organizations, the corporation is assured of close contact with the industry combined with independence of judgment and action in the investment of its funds in new or developed enterprises.

INVESTMENTS are diversified amongst the industry's various activities including aircraft manufacturing, transport operations, airports, engine manufacturing, accessories and other allied operations. Not over 5.5% of the corporation's assets were invested in any one enterprise on July 31, 1929.

ASSETS as of July 31, 1929 exceeded \$1,200,000, without including unrealized book profit on securities owned.

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Information on the Corporation's organization, earnings, investments and operations may be had upon request to Harvey L. Williams, President, Air Investors, Incorporated, 60 Pine St., New York City

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Nothing is class is out-performs every motor in point of power flexibility, workability and economy of gasoline and oil. Watch Axelson performance in the races and in the demonstration tests. But above all, see the engine at the Axelson booth. It is destined to be the talk of the Show.

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Commander Mohr's flight to the North Pole.



For Gargyle's motor flight from New York to London.



Typical Lindbergh's motor flight from New York to Paris and beyond with life in the Air.



Motor flight to the North Pole.



Motor flight to the North Pole.



Motor flight to the North Pole.

Yesterday

From the very beginning of aviation history Gargyle's motor flight has stood out as a landmark in the history of aviation. From that time to the present day, every step in the development of aviation has been made in the shadow of Gargyle's motor flight. These facts alone are but a hint of the reason Gargyle's motor flight is today.



Today

Now aviation has passed the corner. Aviation has taken to the air. Today's commercial transports bear little resemblance to the pioneer planes of an earlier day.

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To keep pace with the march of progress, the modern aircraft engine must travel at a cruising speed of more than 100 miles per hour—must carry easily a payload of many thousands of pounds—must function perfectly, day in, day out, under every condition.

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From the peak of the world's crude oils, Mobilized Engines have developed such an oil—Gargyle's Mobilized Aero II—unusually correct for the job it has to do.

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Design approved by U.S. Department of Commerce . . . 30 hours continuous test . . . Certificate No. 7 . . . in service more than a year on 12 routes of planes.

Manufactured at Madison, Wisconsin, under direction of the Grubb Machine Company, builders of fine machine tools in use throughout the world.

Engineering staff headed by men with long experience in Army, Navy and commercial aircraft engine development.

The Comet may be seen at booth 115, Cleveland Air Show.

(3 cylinders—700 H.P.)

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FOR THE SAFETY OF PASSENGERS

CARRYING passengers adds to your responsibility; makes it even more necessary to reduce hazards by every available means. That's why so many transport companies rely on -TP- to keep the engines running smoothly.

-TP- Aero Motor Lubricating Oil is new—the latest development in scientific lubrication. They have been tested and approved by leading manufacturers of airplane engines and by many leading pilots. They are straight-run oils, not blended or compounded, produced from pure, paraffin-base crude by a process for which patents are pending.

This process has marked a

various over other methods. It removes all the paraffin wax, while preserving all the lubricating bodies in the crude. Elimination of the wax is responsible for its low cold test.

In terms of performance this means uniform viscosity at all working temperatures, maximum carbon deposit and ignition trouble from fouled spark plugs, easy cold priming, immediate oil pressure, perfect lubrication winter and summer, on the ground or at high altitudes—a modernism of safe flying hours. A handsome, practical Piler's Log Book sent free on request.

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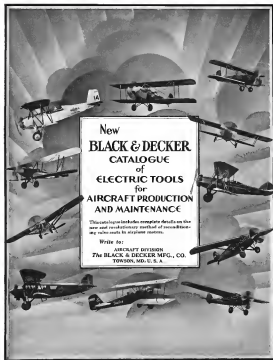
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FLEET AIRCRAFT

FOURTEEN REASONS WHY "THE FLEET" IS AN ECONOMIC PURCHASE



1 Installation of extra fuel tank for cross country flying... affords total fuel capacity of 50 gallons which permits 7.5 hours endurance at cruising speed.



2 Stabilizer is adjustable from either cockpit while in flight. Fin is adjustable on ground.



3 The fuel tank is in upper wing... positive gravity feed... patented fuel gauge accurately records level of fuel. Tank can be drained in any flight position.



4 The engine is bolted to a patented three-point engine mount which absolutely prevents crankcase distortion.



5 Duck-type parallel seats are standard equipment. Rudder pedals are used in place of foot levers. Elevator is operated by push-pull tube.



6 Each cockpit is provided with a safety pad on instrument board to minimize danger of injury in accidents. Undesired vision and any parabolic exit are grounded.



7 Welded fuselage construction... no fit... statically sealed to prevent internal air strength factor requirements are exceeded in all instances... in many cases more than 300 per cent.



8 Wing collars in static test carried actual load of about 7 times—nearly 50 per cent greater than Department of Commerce requirements.

9 Wings are of all-metal construction with exception of spars and riblets. Adapters are operated by push-pull tubes.



10 To increase bearing area in the wood and to prevent play developing in joints... every bolt piercing the wing spar is surrounded by a large diameter ball-bearing bushing. This is one of the many refinements which give "The Fleet" long life.



11 All wood parts are protected by three coats of first grade spar varnish... one more coat than required by the Army and Navy. This thorough protection not only prolongs the life of the plane, but makes it serviceable in all climates.



12 Wherever there is appreciable motion between bearing parts, bronze bearings are employed... adding considerably to both the life and workability of the parts.



13 To provide a more substantial and beautiful finish... six coats of dope are used on all fabric parts. Ordinarily four coats of dope are considered sufficient.



14 Wing fittings and other metal parts are end-metallized... a more costly process than zinc plating, but three times as effective against corrosion. Every part is painted after plating.



FLEET AIRCRAFT INCORPORATED
BUFFALO NEW YORK

RAILROADS • STEAMSHIPS • AUTOMOBILES AND NOW AIR TRANSPORT



THATS the big transportation field today. North—south—east—west—it is daily growing in importance in every progressive community. The growing pioneer days are over. Requirements and possibilities are known and anticipated, capital is deeply interested, and keenly invested. If you—or a group of your business associates are interested in this rapidly developing field—you want full information.

Facts—graphs—charts—verified figures—have been prepared to help you. They show how and why. The *Concordator*, (Naval Reserve prototype of the Consolidated Patrol Flying Boat PY-1, now used by the Naval Air Service), is especially adapted to the immediate and growing needs of air transportation. The *Concordator* is an all-American product—all parts are standardized—an important fact in ensuring minimum maintenance. Write for data today concerning your particular transport problem.

The *Concordator* has an overall length of 40 feet and a wingspread of 100 feet. It is built to carry a useful load of 8000 pounds, with passenger accommodations for 22 persons, and cargo capacity of 100 cubic feet. Cruising range 1500 miles at 115 miles an hour.

CONSOLIDATED AIRCRAFT CORPORATION
BUFFALO, N. Y.

AVIATION
August 26, 1929

21



A THOUSAND APPLICANTS FOR FOURTEEN SEATS

SIX WEEKS before the Transcontinental Air Transport service commenced, the Pennsylvania Railroad reported having received more than a thousand applications for tickets for the first trip. In cash, this represented more than \$350,000.

Last year the flood of money poured into aviation securities proved the public's faith in the future of aviation. This year, in this way, the public has proved its faith in the present of aviation, when it is conducted by organizations that command confidence. In places the public has learned to rely on for dependable, safe, comfortable transportation.

It is a revealing picture, particularly to those operators who debate the need for further expansion of equipment at present. For it shows that the people who can afford to fly, who need the time flying saves, are ready and willing to fly. They've discarded those vague

"promises" not to fly, you encountered so often a short time ago.

It points to a very near day when your present facilities will prove far from adequate. For when a thousand people apply for fourteen seats, all signs point to the need for more seats.

Ford planes are now being built at the rate of four a week. The expansion of our manufacturing is predicated on the increasing public demand for transport flying service. It is an anticipation shared in so many quarters that it is still necessary to order a Ford plane well in advance of the time it is expected to be placed in service. Plan now for the needs you must meet next spring.

THE STEVE MORAN AIRPLANE COMPANY
DIVISION OF
FORD MOTOR COMPANY
Dearborn, Michigan

Ford's new shape outlines at the Ford Airport at Detroit



THE BACH TRANSPORT AND SANTA-FE'S CHIEF.



BOTH RIDE ON PORT ORFORD CEDAR

THE same everlasting quality in Port Orford Cedar that has kept untreated ties on Santa Fe roadbeds for almost years without replacement, alike exposed to nature's merciless elements...is found in the stout Bach wing!

Co-Ve-Co Plywood used by Bach and other aircraft manufacturers, is made from carefully selected Port

Orford Cedar. Cut from cold, weathered logs it retains nature's tremendous ingrained strength, and yet it is extremely light in weight! Its covered panels may be prefabricated to a tolerance of .001 of an inch in sheets measured by even the slightest imperfection. Send for samples, and then specify in your next order — "Co-Ve-Co" Plywood!

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A - COMPLETE - LINE - OF - AIRCRAFT - FOR - LAND - AND - SEA

The Emco Challenger can carry over 1000 lbs. of cargo in the main cabin and 100 lbs. in the baggage compartment.



America's
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comfortable - medium priced transport plane - the

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PERFORMANCE

Wing Load 110 lb. sq. ft. (1939 est.)
Cruising Speed 180 m.p.h. (1939 est.)
Landing Speed 45 m.p.h. (1939 est.)
Takeoff Speed 45 m.p.h. (1939 est.)
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REMARKS

Approved for flight by the Emco Challenger may be used by the Emco Challenger on all other routes in the United States, except in the Pacific Northwest.

DESIGNED from sound engineering principles proven by 15 years experience in commercial and military aircraft — built by master craftsmen in a modern factory — powered with three Emco Challenger engines — the dependability of which has exceeded the world, the Emco Challenger offers dependable transportation with maximum safety and comfort.

Only the finest of approved materials are used in the construction. A unique method of construction reduces noise to a minimum, and the large, luxurious upholstery, individual chairs assure passenger comfort whether the flight be a tourist ride or a business trip.

First cost is consistent with practical attainment and economy of maintenance and operation means profit. *Careful and prompt in repair.*



EMSCO AIRCRAFT CORPORATION

DOWNEY CALIFORNIA

STABILITY

—the unseen pilot,
rides in every Command-Aire



During a recent coast-to-coast flight from San Diego to Los Angeles in one hour and thirty-eight minutes without ever touching the deck, Command-Aire's model 312 powered with Conquest Challenger 250 H. P. Motor.

THIS complete security you find in a Command-Aire is due to positive, built-in, all-around responsiveness in the plane itself. You sense a subtle difference the moment you're in the air. The invariable stability of the ship gives you a serene feeling that a safe pilot is in the controls. And that is for stability holds the rock in every Command-Aire.

The exclusive design of Command-Aire's chassis systems make it the safest plane built — the ship that *positively* will come out of any spin, unaided — the only plane over which the pilot has com-

plete control at all speeds! Even should the engine stall, the pilot can safely land his Command-Aire.

Command-Aire flies unaided through the roughest test an airplane can meet — when the pilot leaves the cockpit and stabilizes the fuselage, while the plane continues to fight on — and perfect self-control. That is in no other plane built, but a



routine, everyday Command-Aire factory test.

This amazing balance and stability is achieved through the slatted joining of aluminum to the lower wing—one of 10 CARBON PRINTS of structural superiority built into every Command-Aire. Aeronautical engineers are looking for safety and stability in the planes they buy and fly — Command-Aire supplies both to a superlative degree. May we tell you how?

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COMMAND-AIRE



THE PLANE FOR WIDER SALES



This picture shows the accessible location of the N.Y.A.T. airport at North Beach, Queens, on Bay city Bay. The new route at the left shows the path an airplane is now cleared to take in 15 minutes. The heavy ramp and the convenient dock for mail-buses can be seen in the plane.

THE NYAT AIRPORT at NORTH BEACH is only 15 minutes from Manhattan now in operation for seaplanes

HOW to get in and out of New York City has been a problem to owners of seaplanes. In recognition of this segment for a seaplane flying base, accessible to New York, 3 1/2 miles from the heart of civil water currents, changing tides, floating debris and heavy water traffic, New York Air Terminals, Inc., has selected North Beach, in the Borough of Queens, for use of its seaplane airport. Here is the quiet, protected water of Boney Bay, western and eastern of seaplanes will find an ideal landing place.

By next year an excellent flying field of about 200 acres will also be available at North Beach.

Speed courses operating on regular schedule between the airport and East 63rd Street, Manhattan, provide quick access to the city. The running time is only fifteen minutes, affording the quickest passage from any airport in Manhattan Island. There is also a convenient motor route by way of the 59th Street Bridge.

Air Transport companies, air commuters and sportsmen flyers, using seaplanes or hydroplanes, are invited to make use of this modern airport, constructed especially for their convenience. Here there will find every facility for the safe handling, storage, maintenance and inspection of airplanes. Spare parts and distributors of marine aircraft will find the port ideal for demonstration purposes. Write for our bulletin A-10.



NEW YORK AIR TERMINALS

INCORPORATED

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LOOKING UPWARD AND FORWARD

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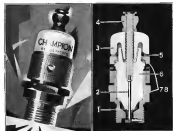
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WICHITA KANSAS

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BY DIRECTION OF THE SECRETARY.

ISSUED SEP. 25, 1939

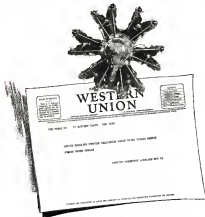
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Charles G. Sawyer
Director of Aeronautics
For Assistant Secretary of Commerce
U. S. DEPARTMENT OF COMMERCE

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AVIATION
August 24, 1929

AVIATION

The Oldest American Aeronautical Magazine

EDWARD E. WATSON

Editor

JAMES H. WATSON, JR.

Publishing Director

R. J. JONES, JR., JR.

Associate Editor

LESLIE E. HERRMAN

Technical Editor

HAROLD F. FOWLER

Press Editor

CLAUDE E. McNEIL

Proofs Editor

JAMES E. WATSON

Assistant Editor

CHARLES E. GALT

Assistant Editor

BART D. GORDON

Contributing Editor

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City Editor: J. H. WATSON, JR.

Editor: E. E. WATSON

Editor: E. E. WATSON

Editor: E. E. WATSON

Editor: E. E. WATSON

Editor: E. E. WATSON

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AVIATION

THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

A MONTHLY MAGAZINE OF AERONAUTICS

EDWARD P. WARNER, Editor

Published . . . August 24, 1929 . . .



Next Week at Cleveland

THERE NEVER has been a craze of transportation available to man which was not vainly prompted by the entrance of sport competition. From the Olympic games of ancient Greece to Charley Paddock, from the chariot races of the Roman arena to Lexington and Saratoga and Epsom Downs; from Phoenician sailing galleys and the war fleets of Indian tribes to Miss America VII and the Bremen; from the De Dion tri-cycle and the one-humped crevettes of Charles Duryea and Elwood Haynes to Major Segrave's Golden Arrow and the problems of the Miller and Duesenberg shops, throughout the centuries the lust for greater speed smolders among the strongest of human emotions. Men have raced with wheelbarrows; they have raced with ferry boats; and when the airplane began to clear the earth with its first few feeble hops, they leaped to the chance to race with airplanes.

There may be differences of opinion about the precise year in which the National Air Races started, and about whether this is the seventh or the eighth septennial or something in between. There can be no doubt that post-war competition started as soon as the Army began releasing JN's for private sale, within a few months after the Arrhenius and it now has ten years of history behind it.

From the point of view of commercial aviation, the first six of those ten years of racing amounted to little. Few men were hypodermic enough, bold and speculative. They taught nothing that was not already known about the performance of military planes, for the military services had already made their own performance tests under conditions much more exact than the race tracks provided. They did, to be sure, encourage the building of specialized racing machines. They taught nothing of the commercial airplane for commercial airplanes were few and far between. Vapors went up after year in outmoded machines, many of them of military origin, which had been designed up for racing competition rather than shipping wing across the

ocean, as they still do, the great purpose of getting aeronautical people together, giving them an occasion for one great shared gathering, but they made little or no direct contribution to the causing of commercial flying. In fact, starting exhibitions, which have often gone along with the race meets, have probably scared off ten novice passengers for every one that has ever been attracted by them.

In the last four years there has been an enormous change, and some of those who were most surprised in 1924 are enthusiastic about competition today. Commercial aircraft construction has come into its own, and the race course is furnishing the direct test of the products. The National Air Races are more than a sporting event giving the industry an excuse for a holiday. They are one of the industry's growing grounds.

THERE ARE many problems that arise in seeking to make the race so useful as possible. Some of them are discussed at length in articles in this issue of AVIATION, and our contributors are not entirely in agreement among themselves. The question of handicapping, or of efficiency competitions with the winner determined by formula, the question of how amateur pilots can best be encouraged to enter in larger numbers; the question of establishing a closer relationship between the race and actual commercial operation, all these and others demand further study and must steadily improved treatment.

If the National Air Races are to continue to grow in importance to the industry, they must be predominantly commercial. They must have a drawing power of their own, independent of any military patronage. They must be planned to show the progress that has been made in developing commercial craft as well as to display pure speed, and to discourage any dangerous or foolish trends in design. Cleveland's race, more than any of its predecessors, is of and for the commercial industry. It is the standard flag for the winners!

regularly hazardous incident of entertainment would be tolerated.

The Contest Committee also provides in a general way over the arrangements of insurance of competition licenses actually administered by the secretary of the Committee. Capt. Luke E. Christopher at present holds that position, his predecessors having been Mr. Carl F. Selvey and Mr. J. Russell Shaw. The work of licensing steadily increases with growing interest in sporting contests in the air, and during the first seven months of the present year 443 sporting licenses which are necessary for entering into sanctioned competition and which must be renewed annually, have been granted by the Association.

SINCE ALL COMPETITORS in the National Air Races must secure the sporting license before taking part, the total number will no doubt be restricted to 500 at most during the coming month, against a total of 449 for the whole of last year. The holder of a license secures the privilege of entering into sanctioned competition, and he must participate only in sanctioned competition. For flying in an unsanctioned race he is subject to censure, and his license is forfeit. In this the National Aeronautic Association has followed the precedent set by the American Automobile Association, which had to deal in the early days of dirt track and speedway racing with difficulties very similar to that which would confront a similar competition were to get out of

number were of course temporary military pilots who received their "tickets" during the war by simple application without the necessity of any special test.

The statistical summary gives some idea of the scope of the work that we have undertaken. Certain of our activities have gone on unchanged throughout the Association's existence, but our relations to such important competitions as the National Air Races have gradually been altered.

THE FIRST YEARS in which the Air Races were held, there was no little experience upon which to build that best representatives of organizations were most eager to have detailed advice and help from Washington, and for several months prior to the Race Meet the secretary of the Contest Committee would spend much of his time in the closest city, conferring with the officials and helping them to work out and execute the plans for the meet. That has now become unnecessary because the various chapters of the N.A.A. now have contact committees of their own to properly handle the work. No longer is there the same need for direct control or supervision. Race management is a profession in itself. Such men as the coming war at Cleveland are sponsored by men who have already learned the ropes and dodged the pitfalls elsewhere. The Association's function has become a supervisory one.

We have not lost our interest. It has not diminished in the slightest degree. We consider competition, both local and national, as of the utmost importance, not only for the industries whose products they test but for both professional and amateur pilots. We look forward to the development of air racing as a sport as well as a business, and we are most anxious to encourage it. Anything possible will be done by this Association to stimulate events which provide interesting competition for sportsmen pilots as well as officers designed primarily to bring out the real efficiency of the commercial planes. I have visited with special satisfaction the inclusion of various handicapped events in the Cleveland meet and the attempt to devise new and improved handicapping formulas.

I hope that we shall find the means of keeping up interest as well as purely local competition. For the first time since 1928 the Schneider Cup is being competed for this summer, only a few days after the end of the Air Races. The race will be held in England, and at least nine European governments expect to be on hand with full teams. I personally deeply regret that it is not possible for this country also to present three entries at the starting line with machines and crews representing the best and most up-to-date thought and manufacturing skill in the American industry. At this writing I am glad to be able to state that the N.A.A. has formally entered Liege, Alfred J. Williams as the American participant in this race, and we are gratified for his initiative and perseverance in the endeavor to keep America in this high-speed competition.

The race for the Schneider Cup is being run in England this year, and it is early too well at hand and soon over. Our own great event, enlarged so that it now spreads over more than a week in the National Air Race Meet. The National Aeronautic Association within all possible means to the events which have been so carefully planned. I urge upon members of all chapters to give us possibly the best means of doing so that be to Cleveland, as a spectator in any case and as a competitor if possible.

THE NATIONAL AIR RACES AND

Commercial Aviation

By MAJ. CLARENCE M. YOUNG
Director of Aeronautics U. S. DEPARTMENT OF COMMERCE

THE ANNUAL event in the aviation industry known as the "National Air Races" has been a constructive force in the development of civil aviation, and in promoting its use as transportation. Particularly it is true that where the rules governing the various included contests have been devised to bring out the greatest role of design and performance rather than the spectacular and "circus" phases.

An added factor which has contributed tremendously is found in the combination of the event with a comprehensive still exhibit of aircraft and accessories. It affords the layman or prospective customer an opportunity to judge appearances and construction in detail, and to observe actual performance and flight characteristics under test conditions.

The various individual race events which are limited to "track jobs" usually bring out the best which a manufacturer has thus far developed for production, in a given class. By its comparison, for the benefit of the public, with the greater product of any other manufacturer, and the result is reflected in the attitude of a market which is rapidly becoming more and more discriminating.

The events which are limited to production aircraft—free-formal so to speak—are a demonstration in design for the requirements of the particular event and, from the experience gained, incorporate demonstrated improvements—whether of speed or efficiency—in its



Maj. Clarence M. Young standing beside the biplane with which he won the title race by the Department of Commerce.



F.A.A. certificate required of all pilots who compete in sanctioned races.

the hands of the aeronautical industry and the genuine aviation enthusiasts and to those of inequitable and self-seeking parasites. Against even the beginning of any such difficulty the Contest Committee, backed by the Association, has constantly stood on guard.

Consider of our duties in the instance of the F.A.I. license which a pilot must in any case secure before he can fly as an entry for a competition. The license serves also as a very helpful distribution card and passport for international air success. 215 new pilots have received their F.A.I. licenses in this country during the first seven months of the present year which brings the total for America to 7,790. A great many of that

future production has. In this respect the situation is not unlike the "Pulitzer Race" which called for specially designed military planes—designs which have contributed in a substantial way to the present present type aircraft of the Army and Navy.

It should be emphasized, however, that any series of race events, whether national or otherwise, must be conducted safely, and with every unnecessary, hazardous element removed. When they depend for their appeal to the layman upon "thrills" and expected crashes, then they cease to be constructive and do much to retard the general acceptance of aircraft as a vehicle of transportation.

THE AIR RACES AND THE

The Heads of the Aeronautics Branches of the Army and

By HON. F. TRAUBER DAVISON
Assistant Secretary of War

ONLY TWO TYPES of Army aircraft will participate in the 1939 National Air Races and then only in two events which are closed to other Army planes flown by Army pilots.

These events are: (1) The Pursuit Plane Race for the John P. Mitchell trophy; (2) The Utility Plane Race for the General Mason M. Patrick trophy. Each of these races carries a distinct of 150 miles.

For the benefit of those who may wonder why the Army Air Corps does not participate in the Air Races to any greater extent, I would like to give a brief explanation of the policies that govern the Air Corps with respect to speed contests.

It will be remembered that the Army established speed races several years ago. Our participation was not so much for the purpose of emerging victoriously from these contests as to gain experience and material for the evolution of a speedy, well performing pursuit plane. This aim has been realized in our present day pursuit craft.

The Air Corps has not yet digested the information obtained during those racing days, and until that process of digestion is completed, there is no aid for the Army



Hon. W. Tucker Dornier

to engage in the building of speed racing planes. It must be borne in mind that racing planes are extremely costly and under the limited appropriations set aside for Army Air Corps we cannot afford to spend money on experimental construction which does not serve a specific military purpose.

In the past participating in the general program of the National Air Races, the Army watched the performance of the various types of planes and engines with deep interest, because the lessons learned on the speed course are found to have important bearing on the further development of military as well as civil and commercial aircraft. That air races are doing so much for the development of commercial airplanes as did the early automobile races for the advancement of the motor car is a foregone conclusion.

The continuous progress made by the aircraft industry during the past few years and the remarkable expansion of commercial aerial activity that has taken place throughout the country have, among other things, produced many splendid types of planes that add interest and thrill to any aerial racing events. Even as the aircraft industry in the United States has advanced to its present almost enormous strength without government subsidy, so I venture to say, our National Air Races will continue to grow in importance and fruitfulness without government support as a means of adding to their value.

National Defense

Navy Speak for Their Departments

By HON. DAVID S. INGALLS
Assistant Secretary of the Navy for Aeronautics



Hon. David S. Ingalls

THE BELONGINGS established at air races such as the National Air Races to be held at Cleveland the end of this month, are an indication of our present strength in the air in time of war. These events tend to indicate whether or not our own aeronautical engineers are capable of producing as fast and speedy planes as those of other nations. And the question of speed is of tremendous importance in any air conflict. The higher the speed of a plane, the greater chances it has to possess an air enemy without being detected. World War experience clearly shows that the majority of pilots during the war were brought down from surprise attacks by high speed planes. Our Army and Navy aviation personnel may be the best trained in the world, but unless we can furnish them with planes which are as fast and speedy as those of the enemy, they will be of little value in defense of our country in time of war. Hence, to stand charged with our national defense in the air, the breaking of speed records at air races is of vital interest. It is the winning racing plane of today that is the parent of the fast fighting machine with which our air forces will be equipped tomorrow.

The National Air Races and other similar races may actually be said to be a competition in aeronautical engineering for the speediest type of plane. Here at these races is afforded about the only opportunity for engineers to try out their latest ideas relative to high speed planes. The continuous out of thinking and looking new types of planes provides the possibility of any constructor building a machine for the sole purpose of saving its location in the air. Airplane construction is too ex-

pensive for that. It is the air race that provides the necessary incentive and compensation for airplane construction to design and build high speed planes which incorporate radically new features making for the replacement of obsolete and so far the increase of speed by thus leading to the development and production of high speed airplanes, air forces have a definite value in the advancement of our national defense program.

It is, of course, true that the racing airplane is not of a type immediately applicable to military and naval purposes. When the one speed of maximum speed is sought far above all others, the rest are likely to suffer by neglect. For instance, racing airplanes do not possess as ready and rapid response to the controls as is necessarily found in military or naval fighters. Again, racing airplanes are not designed to carry any load except a pilot and enough fuel to last for the short duration of the race, while Army and Navy machines must carry additional loads such as armament, radio and extra personnel. Still the changes required to convert a racing type of plane to an efficient fighting type present so great difficulty, and past experience has conclusively shown that the racing plane of the present grades the design of the service planes of the future. The major contribution of the racing plane to military and naval types have been in the direction of modifications in design, permitting isolation of the weakest of resistance presented by the plane to motion through the air. And it will be especially interesting to see at Cleveland what innovations along this line have been made since last year's National Air Races were held.



Formation flying of the Navy V-11 formation during the 1939 National Air Races at Los Angeles



Formation flying of the Navy V-11 formation during the 1939 National Air Races at Los Angeles

AIR RACING

Technique AND Tactics

By

LIEUTENANT JAMES H. DOOLITTLE
U. S. Army Air Corps

THIS ARTICLE is to be a non-technical discussion of some of the things a pilot can do to speed up an airplane, assuming that it is designed, completed and turned over to him a few days before a race. It is further assumed that he can make no major changes in motor or airplane but can tune up the motor, change the propeller blade setting, get an some little streamlining and change the load and load distribution as he desires.

An airplane engine is usually designed to operate best at about 90 per cent of its rated power. Where it is to run continuously wide open, as in a race, it is sometimes possible to increase maximum power slightly by changing the timing. Usually nothing can be done with the valve timing except to be sure that the tappet clearances are correct. The ignition timing may be changed, and more power can sometimes be obtained at wide-open throttle by advancing the ignition timing about two degrees.

The selection of the proper jets for the carburetor is important. The size of the jets to be used depends generally upon the characteristics of the individual motor and the temperature of the outside air. In cold weather large jets give the best results and in the summer smaller jets.

The use of a funnel-shaped duct to force more air into the carburetor is sometimes suggested, but I know of no evidence that it gives any benefit being measured in this way. In racing automobiles hot tanks are sometimes obtained with the air intake actually pointed backward instead of having the opening toward the front of the car. If the duct is left open and unobstructed the motor will suck in all the air it can use. The best results usually provided it sucks out the enough to provide the possibility of a back fire forming a fire hazard, is ordinarily the one that causes the least resistance to flight.

When a motor burns it runs rather than when running freely. For example, if the carburetor is adjusted for perfect mixture when the airplane is on the ground and the motor running up, wide open, against the blocks, it will run too rich in full throttle level flight. It is surprising how often revolvers may be picked

Lieutenant Doolittle's prestige as a pilot is outstanding. No attempt is made his attainments is necessary. In the specific field of speed competition his most notable accomplishment has been the winning of the Schneider Race at Baltimore in 1925. Both pilots of racing planes and their designers should read with the utmost care what he has written here. It is based not only upon his long experience, but upon flight tests made for the special purposes of this article. His studies on the relation between loading and propeller pitch and speed are unusual. Those on the effect of longitudinal stability on speed are believed to be absolutely unique, and will have permanent value among technical works of reference.

up by cranking the altitude adjustment. This is especially true when flying from fields at some distance above sea level and on hot summer days. At La Pa, Bohem, where the field is thirteen thousand five hundred feet above sea level, a Curtiss DH2 engine turned up from one hundred to one hundred fifty revolutions per minute on the ground with the altitude adjustment wide open then with it closed. A rule of thumb to get maximum power through the use of the altitude adjustment is to set it for maximum r.p.m. on the ground and then close it about one-eighth inch. Of course maximum revolutions are



Lieut. J. H. Doolittle on the tail of his 1925 Schneider Trophy racing plane.

obtained with the altitude adjustment completely closed.

In the 1925 Pulitzer Race the late Lieutenant Cyrus Betts, flying the Curtiss Army racer, noted that his 3,1400 engine turned up twenty five r.p.m. more on the ground with the altitude adjustment open about one-half inch than with it closed. To allow for the slight leaning out due to the engine running four in flight he pulled it back one eighth inch (so three eighths of an inch) and probably had the best possible carburetion. It was also noted that the more engine close down when the altitude adjustment was used; while often it was run full rich the fuelage was cooled with cool from the fresh exhaust stacks.

The selection of the best possible propeller for speed competition is quite a problem. Ordinarily everything else being equal, a small thin bladed propeller will give the greatest high speed and one of larger diameter and with wide blades will give the best take off and climb.

The effect on high speed is a particular case of changing the propeller pitch, as shown in Figure 1 and Figure 2. The extreme maximum of performance is a small change in the blade angle is pitch.

In the case the maximum speed occurred when the motor was being held down to 2,500 r.p.m. From the power curve of the motor it could be seen that it was only developing about 436 hp at this r.p.m. At 3,580 r.p.m. the motor was developing about 460 hp, but the plane was almost eight in a h. slower. This is accounted for by the fact that the propeller efficiency increases up to a certain critical pitch, more rapidly than the engine power falls off when the r.p.m. are held down to increase the propeller pitch. Although every airplane-motor-propeller combination presents a special problem it is safe to say that maximum speed will always be obtained with a pitch setting that holds the motor down to well below its maximum power output. Holding the revolutions down has the further advantage that it is easier on the motor and increases reliability.

It is obvious that the speed of a plane can be increased

by closing it up. The designer usually makes as efficient as streamline everything on the plane as well as possible but sometimes, where streamlining outpaces against accessibility, he resorts to its hydrodynamic resistance and it is at these points that the most good can be done. Wherever two members intersect there is an "air-funnel" which causes drag. This is especially true of wing and wing roots. The most common forms of fairing are formed below wood blocks, rounded plate wood, and banded aluminum. Aluminum sheets bent around start and wing end fittings give very good results. These usually take the form of the strut or wing, fit flush against wing or fuselage and are held in place by small bolts along their trailing edge.

The wingtip, in open-cockpit planes, is usually designed to give a maximum of protection and comfort to the occupants, but for racing should be cut down to give a minimum of air resistance even though some discomfort results. It is possible to cut the wingtip down so far that the drag of the pilot's head might offer more resistance than a larger and more aerodynamic shield. The closer the wingtip is to the pilot's head the smaller it may be and still afford adequate protection. The danger in having the wingtip too close to that is that as one of a crash the pilot is likely to strike his head or face on it. From the point of view of safety he should be able to lean over forward without touching wingtip, tail, or equipment board.

All protrusions should be removed or streamlined. All holes should be covered up. A hole in a streamlined surface causes considerable drag. An unused open cockpit, for example, should be covered over, as it may easily slow the plane down as much as 5 m.p.h.

It seems reasonable to suppose that the lighter an airplane is the faster it will fly. This is not strictly true. For every attribute of an airplane a definite amount of power is required to drive it through the air at any given speed. Conversely, with a given amount of power the maximum speed can be obtained only when the airplane is in the attitude which converts it to slip through

the air current. The attitude at which an airplane flies is a function of its weight. The greater the weight the greater the angle of attack required to maintain level flight at any given speed. For a Clark Y wing section, for example, zero lift occurs at an angle of attack of about minus six degrees. Minimum drag occurs at an angle of attack of about three degrees. At angles above this, drag increases three degrees, and at this point the wing is creating considerable lift. We would expect then that an airplane using this wing section would be heavier when landed so that it flew level at an angle of attack of minus three degrees. If lighter it would fly at a smaller angle of attack and if heavier at a larger angle. In either case it would be slower. In reality we must meet the wings only but must consider the airplane as a whole. The wings are usually put on the fuselage in such a way as to give maximum drag at cruising speed. This means that at maximum speed the air is high and there is considerable fuselage drag. The effect of this is to make the airplane, as a whole, slip through the air at an angle of attack of about three degrees. The effect is that of decreasing the angle of incidence, and thus getting the tail down and reducing fuselage drag.

Figure 3 shows the effect of gross weight on air speed for a particular case.

In this case maximum speed actually occurred when the plane was so light as it could be made, but this is not usually true and is true only because the airplane was of the heavy military type and already designed primarily for high speed. In a machine with light wing loading and fairly high power the maximum speed may actually be increased by carrying a little ballast.

An airplane wing, when symmetrical in section, is unstable. As the air speed increases the tendency to dive increases. In the complete airplane this is corrected and stability maintained by a down load on the horizontal

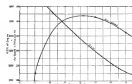


Fig. 1—Air Speed Against Fuselage Loading

stabilizer. In any normal airplane this down-load is very large at high speeds. The greater the down-load the greater the tail drag, and the more it slows the airplane down. If weight is put in the tail the negative angle of the stabilizer may be reduced. This reduces the tail drag and speeds up the plane. This can be done only where the stabilizer is adjustable, and we actually be

come so far that the airplane will ultimately become so unstable as to be uncontrollable. A very unstable plane cannot be pulled out of a steep dive, the instability making the tendency to dive greater than the controls can overcome. Another bad feature in an unstable plane is "bailing," a tendency to dive and come cross through the pilot as trying to bail the plane in steady level flight. An unstable plane is very difficult to handle on the pylons. When landed up and pulled in for a turn the tendency is for it to circle higher and higher and it is usually necessary to push forward on the stick to regain a normal flying attitude. The more unstable a plane is the more quickly it slips to and the more dangerous it is. While in South America I installed a thirty-gallon gasoline tank behind the pilot's cockpit, in a Curtiss Hawk, in order to increase the cruising range. This made the plane very unstable and the first time it was permitted to get in a steep bank did it half roll and dive before it could be recovered. The same thing happened with the Verville-Sperry racer when extra tanks were put in in 1923.

The effect of weight distribution on air speed, where the total weight is kept constant, is shown in Figure 4. The speed is plotted against the longitudinal position of the center of gravity with respect to the mean wing chord, since that is the factor having the largest effect on longitudinal stability.

The curve shows that maximum speed was obtained at a point where the plane had just started to be un-

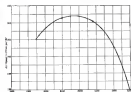


Fig. 2—Air Speed Against Pitch Position

stable. With the center of gravity at 42 per cent of the mean chord the airplane was very unstable and bailed badly as wings up. It was obviously unnecessary to make the airplane this unstable, as the curve shows that speed had actually started to fall off. (Two hundred and fifty pounds of load was put in the fuselage in back of the tail and to get this condition.) I would have expected the speed to have been lower with the C.G. at 15.6 per cent of the mean chord and am unable to explain why it was not. The plane was so stable with this loading condition that it was impossible to get the tail down when landing.

In all of these tests the same airplane was used, an Army Curtiss Observation plane (O1B A.C. 29-294) mounting a Curtiss D-12 motor and an adjustable pitch propeller No. 28148.

In a race in which all the planes were capable of exactly the same speed on the straightaway, the pilot flying the best race would win. Although there is only a very slight difference in the speed qualifications of the competing machines so that the moments of pitching around the course are not a decisive factor, they are never less important. They must be carefully studied by any competitor who wants to give his airplane a chance to show its true merit.

There was once a race in Europe in which one pilot entered without ever having been over the course and took a nap along. He lost the nap in the middle of the first lap and lost himself some considerable, and was too late to say he lost the race by a large margin. There have been instances in this country, also, of pilots getting lost during a speed contest and going on as unattended cross-country flights, but given good weather and a propeller marked course and a sufficient amount of preliminary practice there should be no danger of that.

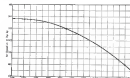


Fig. 3—Air Speed Against Gross Weight

Assuming that the pilot knows his way and does not wonder from the straight path between turning-points, the manner of making the turns offers the greatest opportunity to save time and to display special skill.

Opinions among racing pilots on the subject of turning have varied widely, and specially-piloted and trained pilots have been seen making turns in important races in the past six or seven years with slight or bank sweeping anywhere from the vertical down to about fifteen degrees. Much depends on the angle of the turn and the shape of the course, but the general rule is that the turn should be made so sharply as possible without appreciable loss of speed. If the plane is perfectly trained so hard as to kill the speed badly and to come the straightaway overlooking considerable more slowly than when the turn was started, the maneuver was improperly executed. A sharper and a faster turn can be made by diving slightly while passing around the pylon, losing from 50 to 100 ft. of altitude, than by trying to hold a level course. It was my own experience in the 1935 Schneider Cup Race that it was possible to enter the turn at 242 m.p.h. and finish them at 240, provided about 50 ft. of altitude was lost.

In laying out the general course to be flown an obvious object is to make the best straightaway possible, the shortest possible. To accomplish this the pilot should cut the pylon as closely as possible without actually making disqualification, and should start the turn shortly before

reaching the pylon so that it will be symmetrical about the tangent to the curve. To get in on the correct terms, the course should be tangent to the pylon, which should leave the curved portion of the path. To accomplish this, it is necessary deliberately to fly wide of the pylon by an amount equal to the radius of turn of the airplane (which is to be about 1,000 ft. for a modern racing

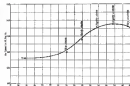


Fig. 4—Air Speed Against Balance

plane) if a 180-degree turn is to be made and by about one-third of that radius if the turn is 90 degrees. The pilot who "dives a lead" on the pylon from several miles away and then squares it at it is using very poor judgment. If the turn is entered and left smoothly, and not made so sharply as to kill the speed, it will be very new to see a circle joining two straight lines. If the plane is pulled around too sharply, the speed will drop and the radius of curvature will decrease. These points are illustrated in Figure 5.

A pilot in flying a large straightaway should try to take advantage of the vertical wind gradient, flying as low as possible when going into the wind, and at a considerable

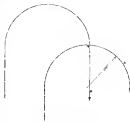


Fig. 5—Right (a) and wrong (b) methods of making a racing turn

greater altitude when it is on its tail. A change of 300 ft in altitude may correspond to a difference of wind speed of as much as 6 or 8 mph and the average speed around the course may sometimes be increased by 2 or 3 mph by this mean alone.

There has been a great deal of discussion of ground effect in racing, and it is a very few cases there has been an attempt to utilize it by flying within two or three feet of the surface, especially when passing over the water. The gain of speed from so doing is appreciable, particularly with a low-wing monoplane. It may be as much as 4 m.p.h. on the straightaways, but it is at least partially offset by the necessity of climbing for every turn. The danger of flying so low is a very fast airplane with limited vision is obvious, and only very rarely is the attempt worth while.

In conclusion, when racing, the following precautions should be taken to insure that the maximum speed is being obtained from the plane.

1. Use best altitude adjustment setting.
2. Set propeller blades for maximum speed.
3. Streamline the airplane.
4. Carry the proper load for maximum speed.
5. Make the center of gravity all as far as safety permits.
6. Make diving turns.
7. Fly wide enough on the straightaways to make the turn without oversteering the pylons and lengthening the course.

• • •

[To illustrate further the points made by Laurence Doolittle upon effect of turning, a few calculations have been made. The first series are based on a triangular course with three equal legs and a total circumference of 30 mi., a course which would probably be a little faster than the average of those used in important events in recent years. The planes have been assumed to have a straightaway speed of 300 m.p.h., and the drop below that figure of the calculated average speed around the course has been calculated for various types of turns.

1. Theoretically ideal turns, no loss of air-speed during turn, pylons exactly hawking air.

Turns per Hour (PH)	Difference Between Pylon to Gap Miles	Calculated Average Speed (M.P.H.)	Acceleration During Turn
1 (unlimited)	10.000	300.00	26 g
2	5.000	299.99	4 g
3	3.333	299.98	1 g
4	2.500	299.97	1 g
5	2.000	299.96	1 g
6	1.667	299.95	1 g

Laurence Doolittle's own work (N.A.C.A. Rept. No. 848) has shown that it is impossible for a pilot to sustain even as much acceleration as is lost when due to gravity for any appreciable time without loss of vision or complete unconsciousness. Although the time required for a turn is only about five seconds, an acceleration of 4 g would probably be about the limit of human capacity for that time, notwithstanding the fact that the plane is theoretically capable of turning on about a 300-ft radius; therefore, it is safely said that a radius of less than 2,000 ft will actually be attained at 300 m.p.h.

2. Effect of loss of speed during turns. Turning on

1,000-ft. radius, 30-mph. triangular course, turns made without loss of altitude.

Rate of Speed Enter Turn (M.P.H.)	Average Speed Around Course (M.P.H.)	Loss Due to Rate of Speed
1	299.96	.04
2	299.95	.05
3	299.94	.06
4	299.93	.07
5	299.92	.08
6	299.91	.09

III. Effect of shape of course. Course assumed to have all its sides of equal length in every case, and all turns equally sharp. Turns made on 1,000 ft. radius.

No. of Sides	Distance Actually Flown	Average Speed
3 (one and a half)	30.000	299.75
4	30.000	299.83
5	30.000	299.90
6	30.000	299.94

IV. Effect of flying straight at pylon (as in B, Fig. 5), instead of going wide enough to make turn symmetrical about pylon.

No. of Sides of Course	Distance Actually Flown	Average Speed	Loss of Speed by Amount Flying
2	11.777	299.47	4.53
3	15.768	299.12	8.88
4	19.688	298.54	14.46

V. Effect of banking on the straightaway to make up for loss of altitude during a turn. Speed of 300 m.p.h., 30-mile triangular course.

Loss of Altitude on Each Turn (Feet)	Loss of Speed Due to Banking (M.P.H.)
0	0
50	.08
100	.15
200	0.30

All of these effects on speed of course very approximately inversely as the length of the course. On a 15-mi. course they would all be doubled.

The total loss of average speed can be roughly determined by adding the several component losses Laurence Doolittle's tests in the Schneider Race of 1925, which he cites as his basis, may be used as an example. Turns on a radius of 1,000 feet on a triangular course would drop the average speed 2.05 m.p.h. A drop of 2 m.p.h. during each turn would cost another 36 m.p.h. all the average. The necessity of climbing 36 ft on each straightaway would represent another 36 m.p.h. With perfect turns to these specifications, in other words, the total drop of the average speed below the straightaway maximum would be 50 m.p.h. Actually perfection is unobtainable. A good recent pilot would probably drop another 4 m.p.h. by flying wide on the turns, another 4 by approaching the pylons at the wrong angle, and at least 4 by deviation from the straightaway course and use of the controls. To make an average speed within 3 m.p.h. of the straightaway maximum on an equilateral triangular course, or within 7 m.p.h. on a square, as has generally been laid off for the Schneider Race, would be doing very well. Actually, the difference between straightaway speed and course speed for modern racing machines—E. P. W.]

A FORECAST OF THE *Cleveland Show*

By LESLIE E. NEVILLE

WITH THE LIST of exhibitors for above the two hundred mark, indications are that the National Aeronautics Exposition, which opens to-day (August 24) is the Cleveland International Aeronautics, will be one of the largest representations in the history of the industry. In addition to the contents placed at the airport, nearly every manufacturer of aircraft and all of the allied industries will be represented.

It is expected that the crowding of exhibits noticeable at some of the previous air shows will not be characteristic of the Cleveland exposition as most of the space requirements are considerably larger than those made in previous years. An elaborate decorative scheme has been developed for the exhibition during the exposition.

A tendency toward the use of higher power airplanes to provide adequate reserve is indicated by consolidation of the planes to be exhibited. This is made possible by increase in output of many of the new models of engines offered by the various manufacturers. Another fact worthy of mention is the adoption of two former military airplanes to commercial use.

A biplane and a monoplane will be available for inspection in the booth of the Aeromarine-Klemm Company. The monoplane will be powered with a LeRhoe engine while the biplane will have the usual Siemens installation. Two other planes of this type will be available for demonstration on the field.

The Alexander Bader, which was exhibited for the first time at Detroit last April, will be shown at Cleveland with the Wright J-6, 165 hp engine. J-6 and Klemm installations will be entered in the racing class.

Two Arrow biplanes also entered high-speed will be exhibited in booth No. 756, by the Atlantic Aircraft Corporation. These planes are powered by the Hino Warner engine which is also manufactured by the company.

The familiar "drive yourself" system has been adapted to the aeromarine field and one of the first airplanes of the Saunders "Fly a yourself" system will be exhibited by the Arrow Aircraft and Motors Corp. The Klemm powered Arrow Sport also will be shown.

Included in the exhibit of the American Eagle Aircraft Corporation will be the new Phoenix, Klemm powered Aeromarine Wright airplane and the Wallace Transplane. Addition of the Wallace Transplane to the American Eagle has follows purchase of the Wallace company by American Eagle interests. The Phoenix

is a three-place, open cockpit type of biplane having interchangeable wings and several minor departures from conventional practice.

A new model six-passenger cabin monoplane known as the "Phantom" will be shown by the Bellanca Aircraft Corporation. Its general dimensions, design, and power plant, this model is similar to the C1P-30. The major changes, however, are chiefly in the landing gear and controls. The new passenger has a wide road landing gear fitted without oil-dramatic shock absorber struts attached to wing struts which also provide an attachment for the forward lift struts of the plane. Controls have been carefully redesigned, leverages have been changed, and a number of pulleys have been eliminated from the system. The stabilizer adjustment also has been redesigned and is now operated by a chain and sprocket instead of the cable and drum.

THE BOKING AIRPLANE COMPANY will exhibit for the first time its new Model 100 high-speed single motor, sport biplane. This machine, which is a commercial version of the well known Army P-32 and Navy P-38, has been placed in the commercial market in an effort to meet the demand for a high performance plane of rugged construction. It is powered by a Pratt & Whitney Wasp engine of the latest type. Also included in this exhibit will be the Boeing contribution to the transport airplane class, the 18-passenger tri-angled Model 80-A. This craft is a biplane and is powered by three Pratt & Whitney Hornet engines. Transport airplane operators will also be interested to see the Boeing 40-24, a cabin biplane designed for four passengers and pilot, and powered with a Pratt & Whitney Hornet engine. This plane is useful for commercial air transport operation and has a pay load of 1,243 lb. The passenger cabin is readily convertible into a mail or cargo compartment.

The Best Biplane, which is entered in the Guggenheim Safety Competition, will be exhibited by the Weaver-Winkle Aircraft Corporation of Glendale, Long Beach. This machine is representative of the three phase biplane type.

An airplane that might be regarded as a larger model of the Curtiss Robin cabin monoplane will make its debut in the exhibit of Curtiss Flying Service Inc. The new plane, the Curtiss Thrush, is a two-place cabin monoplane designed for either the Curtiss Challenger or Wright J-6 engine. An interesting feature of this

exhibit will be the St. Louis Babin, which reveals a combined new semi-revolving museum record. This plane will be shown exactly in its original while exhibiting the record. Other airplanes in the Curtiss exhibit will be a Challenger powered Cirrus, and a Challenger powered General-Aero sport and training biplane. While these airplanes are not new, the Challenger engine installation has been in production for a short time. At the airport, the Curtiss Kingbird, a new type of plane still in the experimental stage, will be shown and may participate in the race.

Three of six units which are in production will be exhibited by the Detroit Aircraft Corp. These three planes are the Lockheed, Ryan and Eastern Flyer biplane. Photographs of the all record-breaking ZMC-4 plane will be included in this exhibit.

The first of the Elenco Cirrus planes will be exhibited by the Elenco Aircraft Corporation. This plane is a two-place end-wing monoplane powered with the four cylinders, air-cooled, Armstrong Cirrus engine. It is a particularly well streamlined and clean design. Enlarged photographs of the ten engine Elenco Challenger, eight-place cabin monoplane will be shown in the booth, while this plane will be at the airport.

A new model will be brought out at the show by the Pfendrich Airplane Manufacturing Corporation. This airplane is the Pfendrich KR-21, a tapered wing Krieger-Krieger biplane powered with a Krieger or Warner engine. This plane is one of several developed by the Krieger-Krieger Aircraft Company, which was recently acquired by the Pfendrich interests. The Pfendrich P1 and the KR-31 also will be exhibited either at the show or at the airport.

In order to show the construction details of Fleet Airplanes, the company will exhibit the fuselage of one of its planes. A completely finished Fleet biplane also will be shown.

Four types of Fokker Virginius will be in the show space in the exhibition hall and a number will be at

the airport. This company, which is now affiliated with the General Motors Corporation, will show its P-10 monoplane, Universal, Super Universal and P-11 Amphibian, all of which have been exhibited before.

Two amphibians, the latest products of the Great Lakes Aircraft Corporation, will be shown in the company's booth. Two Trainers, one of which will be equipped overhead on a revolving turntable in constant motion, also will be shown. Another Trainer will be used by the air race management as a "living post" and other planes of this type will be exhibited at various hotels and department stores in the city.

Private activities of the E. M. Lord Airplane Company will be exposed at the airport, and an indoor exhibit will be had by this company. A new Lord model, however, will be shown at the airport. This plane is the "Speedwing" biplane powered with the 500 hp Wright J-6 engine. Other Lord models also will be on display in the field.

A Wright J-5 powered Model M-1, three place semi-closed monoplane will be exhibited by Moorhead Aircraft Inc. The closed forward cockpit of this plane is entered from the open pilot's cockpit and contains a deck, floor cabinet and other office equipment.

A Gipsy powered Moth biplane will be displayed by the Moth Aircraft Corporation, and two of these planes will be shown on the field. One of the planes on the field will be equipped with the new coupe top which converts the standard Moth into a closed cabin into a closed type of craft. Plans of this type for demonstration both on wheels and on pontoons also will be available.

Another interesting machine will be in the field but not at the show is the latest type of Aquaplane exhibited by the Picoz-Correa Aquaplane Company of America. This will afford an opportunity for the many persons interested to view this unique type of aircraft.

The Wright J-6 powered Sparrow C-5 one cockpit biplane also will be shown.

The complete line of Stinson cabin monoplanes will be shown by the Thompson Aero Company of Cleveland. One function for Stinson.

An innovation in the form of a "catalytic" booth will be that of the Sully Aircraft and Engine Co. No representative of the company will be in attendance but facilities will be provided for persons to leave their cards or addresses. The 1930 model "Flying Dutchman" planes and the SR-3 and SR-5 engines will be shown.

The Travel-Air Manufacturing Company will devote its space to its four and six place monoplanes. Both of these planes are powered with the Wright J-6, 300 hp, engine. The four-place plane (Model 10-B) is also offered with the "New Whirlwind Seven" engine.

For the first time, the commercial version of the well-known Vought Corsair military plane will be exhibited by the Chance Vought Corporation, one of the units of United Aircraft. This plane, the Boeing Model 190, has been available in the past for military purposes alone. The commercial craft will be identical with the military product as to strength factors and construction details, the only change being the removal of all military equipment and substitution of equipment for private and commercial flying.

As in the case of several previous shows, airplanes in actual flying positions will be shown by the Waco Aircraft Company, formerly the Advance Aircraft Company. The new J-6 five cylinder and the new J-6 seven



Elenco: A side view of the new six-cylinder Elenco Cirrus monoplane with the Challenger engine and bearing a number of points of similarity to the Curtiss Babin. Below: The latest model of the new series of the standardized American Hawk.



cylinder Straight Wing model will be equipped from the crating at the auditorium while the new J-6 seven cylinder Taper Wing model will be shown in the position of a climbing turn and revolving. An innovation in the form of a tripped type landing gear will be installed on all Waco planes.

The Elmo-Warner Engine, which is now in production at the Hartford factory, will be exhibited in the company booth at the show. This engine is a seven-cylinder, radial air-cooled type rated at 115 hp. It is said as standard equipment in all Aero planes.

An exhibit consisting of one or two engines on revolving stands, and one engine with a specially designed cowling and wood propeller on a stand, is planned by American Cirrus Engines. Major parts of the engine, photographs of planes throughout the world using Cirrus engines, and other features will mark the exhibit.

A complete exhibit of its latest models of seven-cylinder air-cooled radial engines will be shown by the American Aircraft Engine Company. These models embody a number of refinements. Engines of this type will be operated in a series of tests and will be centered in exhibits during the period of the show.

Space 30 and 31 in the Exposition will be devoted to the exhibit of the Continental Motors Corporation. The Model A20, 100 hp radial engine will be shown and a plane powered with the engine will be at the airport.

Included in the engine exhibit at the Curtiss Babin Service booth will be the new Crusader, an inverted, six-cylinder-in-line air-cooled power plant developing 110 hp. This engine is the most recent addition to the Curtiss line. This is the first engine of the air-cooled, inverted

type to make use of six cylinders in line.

A 225 hp, 180 deg. opposed air-cooled engine will be shown for the first time by the Dayton Airplane Engine Company, manufacturers of the Dayton Hawk engine. Two Dayton Hawk, four-cylinder-in-line, air-cooled engines also will be exhibited by this company.

Included in the exhibit of General Air Motors Company is a five-cylinder radial air-cooled engine designed by H. S. Moore, and embodying some departmental (some commercial) process. One of the special features of this engine is the valve arrangement. Two intake and one exhaust valve per cylinder are used. A two-way intake pipe also is employed and found to be effective. A special method has been devised for clamping the aluminum head to the steel cylinder. This method makes use of a positive arrangement, employing a special clamp. A slipper type piston is employed and a unique intake gas induction system is used on this engine. It is also equipped with a special slide-valve system.

Parts and completed R-5 engines will be displayed by the Kinner Airplane and Motor Corporation. The regular Leifford 60 and 90 engines of the Model D series will be exhibited by the Leifford Aircraft Engine Corporation, and a display board showing a number of engine parts also will be displayed. While it is not yet definitely determined, it is expected that one of the new Leifford 60 engines will be on display. This power plant is like the present Leifford 60, except that it has cylinders with steel barrels and aluminum heads at 4 in. larger bore, and a new type valve operating mechanism. The engine is expected to develop a 100 more power and to weigh considerably less than the present model. Cylinders of the type used on this engine will also be available as the Leifford 90, and this model will be known as the Leifford 90.

Two engines, one a nine cylinder and the other a seven cylinder, radial, air-cooled type, will be presented by the Lycoming Manufacturing Company at the show. The nine cylinder engine has a piston displacement of 645 cu. in. and a Department of Commerce rating of 145 hp at 2000 rpm. The weight of the engine is approximately 165 lb. dry, or 23 lb. per rated horse horsepower. The seven cylinder engine has a displacement of 300 cu. in. and is identical in detail and design to the larger engine. As in the case of a number of the newer engine designs, the exhaust manifold is mounted between the propeller and the cylinders and is streamlined. Ventilation has been provided between the man-



A Pratt & Whitney view of the Pratt & Whitney radial engine.

fold and the crankcase to avoid undue heating. Valve seats are somewhat of a departure from standard practice in that they are made of "321S" steel.

The Pratt & Whitney Aircraft Company, which will occupy spaces 25 to 30 inclusive on the main floor of the arena, will exhibit four engines and parts showing their original features. Two models of the latest type 420 hp. Series C Wasp, the duct-drive and 2 to 1 reduction geared types, will be shown. The most



The Hispano-Suiza 12B engine.

recent type of Hispano engine which develops 525 hp. also will be shown in both the duct-drive and geared models. An air transport map of the Western Hemisphere depicting Pratt & Whitney powered lines will be displayed and the walls of the booth will be lined with posters showing the various record-breaking planes powered with Pratt & Whitney engines.

One of the latest 110 hp. Sauria engines will be exhibited by the Warner Aircraft Corporation. Parts of the engine also will be shown.

A space approximately 200 ft. in the main auditorium close to the main entrance will be occupied by the exhibit of the Wright Aeronautical Corporation. This display will include one Wright Cyclone 8-1750, one cylinder radial engine rated in 525 hp.; the three engines of the J-4 series, and the Gyron engine. A working model section of the Whirlwind, Nike, set away to show the details of internal operation and driven by a small electric motor also will be shown. It is also planned by the company to show the historic Lawrence two-cylinder engine and a collection of photographs showing Wright engines in use in various parts of the world. One of the Whirlwind nine engines will be

mounted into a semi-husings and shown completely equipped with propeller, and electric starter.

Exhibitors in the engine accessories will be the recently developed air filter for radial engines which is offered by the Air Mase Corporation.

The Zenith Aviation Corporation will be represented in the exhibits of its subsidiaries: Eclipse Aviation Company, showing a complete line of starters and generators; Bendix Airline Company, displaying Bendix airplane wheels and landing; Stromberg Motor Devices Company, Stromberg carburetor, and Scintilla Magneta Company, which will show the complete line of Scintilla airplane engine equipment. Two different types of Scintilla magnetos embodying the latest design features will be shown.

A sterling exhibit consisting of the panels and samples is offered by Berry Brothers. A feature of this will be a mechanical test that sings and performs and is called as the "bird color" mechanism.

Bobolink cuttings of crankcase, cylinder heads, pistons, valves, and other parts will be displayed by the Bobo Aluminum and Brass Corporation. Cuttings in Bobolink "X," an alloy recently developed by the company also will be shown as well as a line of locust and steel ball-bearing steel bearings for aircraft engines. A number of castings used in control systems also will be shown.

A new line of "Super-energy" aircraft engine magnetos will be displayed by the Robert Bosch Magneto Company, Inc. This line contains all the features of the Robert Bosch inductor type magnetos. A number of new features, including electric spark control and auto thinking are embodied in these designs.

An instructive display is planned by the Chicago Screw Company and includes a complete line of air plane bolts and nuts, as well as intricate screw machine parts for airplane engines. The feature of this display will be a metallurgical exhibit showing samples of finished bolts, bolts that have been subjected to tensile and shear tests, photographs of proper and improper treatment of heat-treated products and other features.

A large display of shock absorbers is planned by the Cleveland Pneumatic Air Company. A semi-circular stand 36 ft. in length and showing a full line of aerial shock-absorbing units will be on display. Auxiliary features of the Curtiss exhibit will be a display of Curtiss-Rae metal propellers and a number of wind-tunnel scale models of planes in the Curtiss line. The company's booth will represent an indoor Curtiss Airport with imitation grass covering the floor and a white line forming the barrier front.

The first formal exhibit of the two extremes of the



A photograph of the Bellanca "Pacemaker" showing the new landing gear design.

line of standardized airplane flows manufactured by Rolo Aircraft Corporation will be at the show. The B-1325 first in its place with gross load range of 5,100 to 1,350 lb., while the J-5500 is designed for airplanes with gross load range of 4,350 to 5,100 lb.

Previous parts, built to the specifications of engine manufacturers and standard drill jig bearings and internal grinding spindles, will comprise the exhibit of the Leo-Cutler Aircraft and Tool Company. The booth will be decorated in the same manner as that of the company at the Detroit show.

Booth No. 141 will be devoted to a complete line of Radio Aircraft storage batteries for starting fighting, ignition, radio and other purposes. These batteries are manufactured by the Electric Storage Battery Company.

Zenith a set of pistons and stem and a display of

High-Speed Free Wheeling Unit, shown Model 154, four gear units mechanism exhibited by Robert Bosch Magneto Co. The mechanism type aerial engine developed by the Robert Bosch.



aerial photograph and airplane parts, the Fairchild Aircraft Manufacturing Corporation will also show the Radio-Airplane landing light and an aerial camera of new design. The new camera in the Model 3-A, and is a general purpose type designed especially for commercial use and takes either vertical or oblique photographs at any distance ranging from 8 ft. This camera is simple in design and completely reliable. It embodies a number of the features of the photographic apparatus designed by Fairchild for military purposes.

While no exhibit at the show is planned by the General Tire and Rubber Company, a specially equipped "Mystery" plane will be staged in the mid-way area from the Pacific Coast to Cleveland by the company. Practically all of the aerodynamic products of the company will be installed as special equipment on this plane.

Examples of the latest use made of blood albumin glue plywood in modern aircraft will be shown by the Hamilton Company. This exhibit will also show the most recent methods by which "glycerol" panels have

been equipped for cabin, luggage compartments, and other portions of an airplane. Decorated panels of both Hamilton and plywood will constitute part of the exhibit and the company's patented "Seam-in-Action" also will have a place there.

Sageone military propellers, a complete line of Miller airplane products mounted on a cylinder, and a number of Johnson products such as ductless pocket street line lenses, air speed indicators, communicating sets, and wheels and other apparatus will be on display by the Johnson Airplane and Supply Company. These booths will be occupied by this concern and a large number of aeronautical products will be shown.

Five standard types of generators in addition to the radio generator, which is a two-voltage machine, will be exhibited by the Loren-Neville Company. The radio



generator is rated 30 amperes, 15 volts, at 2,750 r.p.m., low voltage unit; and 500 watts, 1000 volts at 2,750 r.p.m. high voltage unit. The voltage of these generators is regulated by the Loren-Neville patented voltage regulator.

Demonstrations of arc welding in light baking and other materials, with the W-15 arc welding apparatus, will be conducted at the booth of the Lincoln Air Products Company. This firm and associated company will produce an exhibit of their latest arc welding equipment and samples of welded materials for display purposes.

A large model of the new MacWhysa Safe Lock Terminal will be shown by the MacWhysa Company, and sample illustrations and round down the booth, together with photographs of planes equipped with this product also will be shown.

A considerable and accurate plug propeller is to be the feature of the exhibit of Prueger Engineers, Inc. As a background for this display, the company is planning to show a historical group of propellers dating back as far as 1930.

Two airports have been reserved for the Parlier Application Company which will show its standard line of copper and aluminum tube couplings and aeronautical tubing in all sizes and shapes in both brass and aluminum. Included in this display will be shut-off cocks, flow indicators, check valves, pressure-reducing valves, tank hangers, detachable tank flanges, and profile valves. A graphic cutaway of a Parlier Tube coupling, carried out to every detail will feature the display.

A large sample board displaying the various new products for aircraft manufactured by John A. Seabright Sons Company will be shown. Included in these

products are aircraft wire, galvanized aircraft cord and strand in various constructions, galvanized aircraft ferrous and non-ferrous cables, and power and lighting cables.

One of the latest developments of SKF Industries, Inc., the SKF control pulley, which was recently tested at McCook field under operating conditions, will be shown. As interesting device has been arranged which will suggest to the observer the low friction qualities and the advantages of this type of pulley. In addition, there will be a complete display of the various types of SKF anti-friction bearings.

Adaptation of the Haywood starter to many well-known engines will be shown by Sky Specialties Corporation, which recently took over the Haywood Starter Company. The new Haywood starter encloses several improvements, and is considerably lighter than the previous model.

An illuminated display stand showing the valves and other apparatus made by Thompson Products, Inc., will be included in the exhibit of this company. These valves have been used in many recent flights and were at the scene from the engines of the "City of Cleveland," and "America" will be displayed.

ILLUSTRATED in the airplane equipment of the Westinghouse Electric and Manufacturing Company will be a complete line of two Micarta products, one made, one iron, and other Micarta products, including plates for cabin floors, tail bearing pulleys, fairleads, chocks, rollers, riving, table tops, and timing gears.

Airplane radio equipment will be exhibited by two concerns in the show, the Radioactive Corporation of America, and the Western Electric Company. The Radioactive Corporation will show an aircraft transmitter, aircraft beacon receiver, and communication receiver, as well as other of these products. The aircraft communication receiver, Model AR-1508, is a

R.C.A. product designed to meet the needs of transport companies for a sensitive and selective short wave instrument for receiving from ground stations included in the exhibit of the Western Electric Company will be a long wave receiver for wave lengths between 500 and 1,000 meters, and having a simple dial control, wave driven generator, dynamotor, short-wave airplane transmitters, engine-driven generators, short-wave receivers, pilot head set, and short wave ground transmitters.

Several of companies have specified their intention at displaying their products at the exposition. The Associated Oil Company is planning a complete showing of its products with a particular study on Aviation section on the coast, as well as displays of a different nature at the airport. An important display consisting principally of an animated film on ground board showing the method of cutting Standard grade, Pennsylvanian crude, into its by-products, is to be effected by the Royal Refining Company. Representatives of the Standard Oil Company of America, will be in Booth No. 167 for the purpose of giving information about its products. This is also true of the space reserved by the Shell Petroleum Corporation. The company extends an invitation to visitors at its booth and will have the "Gold Shell," a three-engine Fokker airplane at the municipal airport during the entire exposition. An interesting exhibit is planned by the Standard Oil

Company of Ohio, which has reserved spaces No. 105, 6 and 7, in the southern section. A miniature glass refinery and an edgely demonstrating machine will constitute the entire part of the exhibit. Red Crown Aviation gasoline and T.C. Solen are major products of this company also will be shown. Representatives of the Texaco Company will fly to Cleveland and, headed by Frank M. Hawks, will be ready to receive visitors at the company booth in the exposition building. The company expects to have the entire quota of airplanes in the field in representative Texaco. The Vacuum Oil Company will display various sizes of containers of its new "double range" aircraft engine oils, Mobilac Aero "D" and Mobilac Aero "E" as well as "Mobilignac" for rocket engine lubrication.

Among the numerous showing airport equipment will be the Austin Company, Gilbert and Barker Manufacturing Company, United States Air Compressor Company, and the Westinghouse Electric and Manufacturing Company. An attractive exhibit consisting of electrically operated runway way of the United States, corrected to August 1, 1939, will be shown by Austin, as well as drawings and photographs of airports and buildings designed by the company. In Booth No. 232, Gilbert and Barker is planning to show one of its most recent products, the "Aeraport," a modern building space for airports. Two large sized air compressors, one of large installations, rotary pump, engine clearing pump, high-pressure grinding apparatus, and other non-pneumatic air devices will be shown by the United States Air Compressor Company. The airport lighting equipment displayed by the Westinghouse Company will include its chronically leading field floodlight, marker light display board, sperry type beacons, ceiling light indicators, ceiling lights, and several types of airport floodlights.

ILLUSTRATED among the machine tool manufacturers will be the Crescent Tool Company, De Walt Products Corporation, the National Armory Company and the South Bend Lathe Works. A complete line of tools used in the manufacture, maintenance and service of airplane engines, and airport equipment will be shown by the Crescent Company. The company is arranging an attractive display showing these tools in actual use, including a model of an airport. The complete line of the De Walt Products Corporation, which is being used extensively in the industry will be displayed. This includes the Wrench Master Wrench, a wrench which is a driver drive oscillator metal cutting tool and the Wonder Wrench, which is used for cutting wood. A new study chart, based on the use of the De Walt Wonder Wrench in connection with a Bowley Air Vice in the plant of the Travel Air Manufacturing Company has been prepared by the company. Standard and special screw machine products of national grade will be included in the exhibit of the National Armory Company. The company also will show its "Nanco" spinning drawing dies and collapsing tips. The latter to be displayed by the South Bend Company will be especially adapted to work of an aeronautical nature as required in manufacturing, maintenance and repair. These holes are to be representative of the 96 sizes and types of back ground screw cutting lathes built by the company.



By BRUCE G. LEIGHTON

Director of Sales & Service, Wright Aeronautical Corporation
Formerly Lead Counsel, U. S. N.
Chief of Engine and Landing Division
Bureau of Aeronautics

IT IS QUITE an ordinary thing to hear laymen express disapproval of what they deem the folly of high-speed racing, and to read editorialists in the press insisting that no practical use whatever can come of the swarming speeds attained by airplanes in civil aviation. Such groundless protests, of course, that critical attitude which is always of value to an enterprise, particularly a fresh enterprise which will contain elements of the experimental, and which is based on the economy of demonstrating specifically its utility to mankind. On the other hand, if all these complaints could be made to substantiate that the race course is one of the vital testing beds of aviation, they would perhaps—perhaps with some qualifications—that even the extreme speed of 250 miles an hour is of extraordinary use to them.

Say, for instance, in behalf of our well-meaning critics, we consider the race course as it applies to the commercial airplane—for after all it is the commercial airplane in which the layman and the editorial writer are most interested. And let us begin by noting that of all the characteristics that make of the airplane an important addition to the velocity of the world, speed is the one essential. Because an airplane might have the maximum quantity of safety, comfort, stability, ease of operation, and economy—but without speed there is no acceptable reason for using it in preference to the many other land-based means of getting from one place to another place. The airplane usefulness of this new vehicle, as it applies to the ordinary citizen, is its ability to move him along faster than he has ever been moved before, and this usefulness will increase in direct ratio to the increase of the airplane's speed.

Every commercial airplane—and indeed almost every feasible sort of airplane—is a compromise with the characteristics of a "pure" airplane type. An almost perfect example of the pure type is called, is the ship built for racing; for the sole purpose of attaining the maximum possible speed. The performance of such a race plane is extraordinarily high. The relation between power

Races...

THE TEST-BLOCK FOR AVIATION

required and power available is almost ideal. It requires permit short bursts of speed which are theoretically—and indeed for all practical purposes—up to the limit of human control.

Such a racing airplane for instance, as the English Supermarine S5, which won the Schneider cup race in 1931, gives us what we may consider the perfection of speed. Its 375-hp engine weighed only 900 pounds, an almost incredible refinement for a water-cooled engine. The design of the ship reduced drag to a very minimum. And the speed attained on a straight course, was well over 300 m.p.h. Undoubtedly this record will soon be broken. But it provides us with an ideal of speed: the possibility inherent in a "pure" airplane.

It is obviously impossible to consider the Supermarine S5 as an available commercial airplane, or even as a suitable military pursuit plane. To attain perfect design in either of these types, it is necessary to make the compromise with the pure type which we have already mentioned. In a pursuit plane the necessity of mounting guns would lead to modifications in the fuselage, the improvement of other vision for the pilot involves re-arrangement of the wings; safety factors for the stress of battle flight must be increased, and the outer need to make burns, once released over prolonged flights. These changes reduce, of course, the maximum speed figure possible in the pure model.

TO MAKE such an airplane to commercial use (we are speaking theoretically of course) even more drastic changes would be necessary. Speed and ease of climb must be reduced in behalf of economical operation. Passenger comfort, accessibility, and ease of maintenance must be considered. And all of these factors must stand second to safety and the utmost of reliability.

Yet, with all these considerations, some of the characteristics that enabled the pure type to make its high speed record in the domain of the competitive type.

"This observation is readily removed from the realm of theory and applied with the facts of fact. At Venice, in 1920, Lieut. Luigi Bolchini flew a Sardinia airplane powered with an Ansaldo engine 160-02 m.p.h. to win the possession of the Schneider cup for Italy. The next year, in Venice, the Sardinia was replaced by a plane and engine was 111 m.p.h. In 1932, Captain

Heavy Board of England, flying a Supermarine with a 450 hp. Napier engine was the race at 145 m.p.h.

During these three years, the building of passenger airplanes for civilian use was not highly developed. But such passenger planes as were built in this country and abroad boasted top speeds of 90 and 100 m.p.h. The factors that retarded the Schneider cup races to actual speeds of 107, 111, and 145 m.p.h. were entirely recognized by the designers of aircraft, and very quickly applied to their own work. Streamlining, and the consequent reduction of drag, was the most vital element. Radiation, engine improvements, propeller efficiency and wing design were other demands.

To point out that an ordinary production passenger plane, of standard quality design, in 1929 usually can attain a top speed of 140 m.p.h. is not particularly striking. But to observe that it can do this with engines of half the horsepower used in the Schneider Cup races of 1923, 1925 and 1931—that they can do it with lighter propellers, and fuel supplies far less of cruising—can tell the race fan that with slight odds of landing speed, and engines of reliability over prolonged stretches—these things are striking.

The first Pulitzer race was run in 1930, and won in that year by Lindy C. G. G. Moody, who averaged 178 m.p.h. That is a somewhat high speed, of course, even in relation to the airplanes of 1929. But Lindy Moody flew in a plane designed by Verville purely for racing purposes, and useless for anything else. It was no longer designed for an day or night. Lindy Moody's Mercury racer in this day. Its engine developed 600 hp., and the very low power loading is thus particularly obvious.

In short, the speed records of one day tend to be the normal speeds of days that come after. And this is especially true because of the losses caused by designer and manufacturer from the racing course.

THE WHOLE DISCUSSION of this tendency lies in the ability of designers to reduce the power requirements of the racers—thus effecting great economies—and to maintain the speed of the racers. And it is possible to do this by making use of the numerous ingenuities which racing brings to the design of aircraft.

As a typical example in point, consider the metal propeller. Prior to 1925, wooden propellers had been the standard for the aircraft racer, they were (and are) dependable, and easy to process. Designers of metal propellers had attempted in various ways to prove to the manufacturers that their product was more efficient. But the natural doubts which surrounded any new thing had resulted in the disadvantage of the metal prop, and had prevented any manufacturer from exploiting it.

Then, in 1933, Lindy Alford Williams won the Pulitzer race, spending ten miles an hour faster than his rival. He used a metal propeller. Immediately it was recognized that the metal prop had proved itself in detail as more efficient, and that more efficient means was adopted generally in the industry. The result of this was a perceptible stepping up of maximum speeds for commercial, or passenger craft.

The same idea holds good for numerous other details, almost as important as speed but more technical in detail, and more obscure from the superficial view. It may be assigned as a common truth in the industry that every recognized race has some effect upon the manufacture of airplanes. When A won a speed contest from B, the instant question throughout the industry is, "How did he do it?"

His equipment is examined. His techniques are tested in the laboratory and on the track. If they will stand the harsh strain that they will be called upon to endure in commercial aviation, they are incorporated in existing designs, or designs are altered to incorporate them.

THE RACES current at Cleveland offer even more valuable stimulus to the designer of commercial craft than such international events as the Schneider Cup races. For many of the planes entered here are, by reason of their classification, commercial planes. To take another side as two of speed out of their craft and their engines, pilots are more than likely to make slight changes. It follows naturally that these changes will be subject to further use and, if found permanently useful, incorporated in future designs.

Of course, there is stress again upon the engine as my racing plane. Always, the engine is forced to its full throttle, and called upon to stand strains that ordinarily are not placed upon it. Let us suppose that an ambitious racing pilot wishes to force his engine—designed for 2,000 r.p.m.—to 2,400 or 2,500 r.p.m. The changes effected by the manufacturer for the purpose of the race are examined with new interest if the pilot wishes to make the race. If these changes seem to pay well in the race itself, and in bank and flying tests made afterwards, they are very likely to be incorporated in the stock model, thus increasing its efficiency and making it a better product.

The logic, to whom we referred at the outset, generally address their attention upon high speeds of the airplane and the automobile in combination. They make no distinction between the two vehicles when examining the high velocities sought by both. Of course it is their lack of intimate knowledge of aviation which ordinarily stems from seeing that there is no more danger to the passenger in flying at 200 m.p.h. than at 80, provided of course the ship is built to stand this added strain. Then, to, on the other hand, a definite limitation to safe speed is the ground. When an automobile is in the hands of a private owner going more than 80 m.p.h., it becomes a dangerous vehicle for the reason that it must traverse a road, with the consequent road friction and the consequent other anomalies which might be met. This trouble is to be considered. Dangerous curves are to be considered. Irregularities in the road surface, and a momentary loss of the road to the driver would perhaps produce disastrous results.

The airplane, fortunately, is not subject to these limitations. It is quite easily controlled, even at very high speeds. There is practically no danger of the pilot's loss of control. And it is a racing, furthermore, which provides that drastic safety against the situation of man's best efforts. In a race, under this splendid human urge to surpass his fellows, a man will try things that he would not try under normal circumstances. Even if he fails, such is the superior flight in airplanes, the consequences are not likely to be serious. And if he succeeds, something is added to the science of mechanized flight, something that tomorrow the others will exploit quite casually as he strives to move faster than he has ever moved before, from one place to another place.



AIR RACES AND Handicapping

By CAPTAIN R. J. GOODMAN-CROUCHER

O.B.E., F.R.A.S., M.I.A.E.
formerly technical director of the Ministry; now of
Whitworth House Co.

IN ALL FORMS of sport the question of handicapping is of paramount interest to the competitor, and air racing is certainly no exception to the rule. It has, however, remained for the most readers of sports to demonstrate, in so far as "sport science" finishes are concerned, that good handicapping is rather an art than a science, and that the side rule of the handicapper must be accompanied by judgment based upon experience. There are two main divisions into which air race handicapping falls:

Case 1. Time handicaps based on speed of aircraft, the object being a close finish irrespective of individual merit of design. In this case playing dead is not most wise account, so that the actual winner should be the best pilot.

Case 2. Handicap on formula. This is a proposal which has for some time been advocated in order to secure recognition for aerodynamic efficiency of design, placing itself being given weight. In this case the handicap formula must be published several months before the race to afford designers a chance to meet the conditions of the formula. This method is analogous to that employed in yacht racing.

Case 1, Handicap on Speed

In my own opinion, handicap allowances based on known speed are generally preferable to those arrived at by the use of a formula, the reason being that airplanes of all sorts and conditions can then enter with a chance of success, and no racing is thereby rendered more popular.

"Formula" racing on the other hand involves special design being prepared and the degree of success in the race of particular machines which are entered by the formula.

Aerial races may be divided into two classes, short circuit races and extended circuit races.

(a) Short Circuit Races, in, races which consist of one or more laps of a small circuit. In this type of race many of the competing machines have previously made the same course and their actual performance under the identical conditions (except for weather) are known. [This, of course, holds true more generally in Great Britain, where because of the small extent of the country the same pilot and planes come together over

The handicapping of airplane races in England has been rated in a few feet. In these pages the process is set forth in detail by the man who has been most active in developing the methods. The author, long technical expert to the British Air Ministry, has also been handicapper to the Royal Aero Club and all its allied organizations. That he is resident in the United States, current committees here will undoubtedly seek the benefit of his unique experience. The type of competition in which he is a specialist deserves more attention here.

and over again at many different meetings, than in the United States—Ed.]

The estimate of handicap allowances in such cases is simple and rapid.

Such handicaps are usually not published in the program, but are put up on the board just prior to the race. This enables an allowance to be made for the wind prevailing at the time, and also allows for the difference in starting lag of the various machines when the actual start of the race is from a line of the ground.

The general method employed is as follows:

A tabulated form is prepared which is not only of use for showing at a glance the technical data necessary for computing purposes, but is also of value for obtaining predicted speeds in a way suitable for comparison with speeds actually attained. A suitable method of tabulation is given in Table I.

Columns 1 to 4 are filled up from Entry Forms submitted by the entrant.

A typical example of the Entry Form used in Great Britain is shown in one of the photographs.

The weight of aircraft empty (Column 5) is also obtained from the Entry Form, but it is a good plan to

check the figure with records of actual weighing where these are obtainable.

The number of the crew is also given in the Entry Form and a few weights to allow per person is 170 lb. When, however, the actual pilot is known, it is not unfair to credit or debit his weight with a few pounds when his actual weight has been previously ascertained. In this connection it has sometimes occurred that the entrant has decided to change the number of his crew at the last moment.

It is, perhaps, best to make no change in the handicap for this reason, provided that the crew is increased in number, but if it is desired to do so, a rough performance estimate can be made some days before for use in such an event, by which the variation in speed due to a difference in weight of one person (at say 170 lb.) is obtained, and hence the change in handicap becomes a matter of rapid adjustment.

With regard to fuel and oil (Columns 7 and 8) for preliminary calculations an allowance of 25 per cent occurs over actual requirements for gasoline and 50 per cent occurs for oil should be made. The actual allowance made may, however, be dependent on the mileage, for obviously if the size of the tank allows only a small excess it is not probable that the entrant will expend nearly his machine for the event.

The next step is to compute the total weight of the machine for endurance in column (a). The details for a hypothetical case are as follows:

New
Weight aircraft (with water, if any)
from Entry Form 1,624 lb.

Fuel Allowance: A rough estimate of speed is, say, 115 m.p.h. The consumption of petrol is, for instance, 0.52 lb. b.p.h. lower. The cruise distance is, say, 130 mi., and the approximate maximum permissible b.p.h. of the engine, say, 178 b.p.h. Thus the petrol required for the race would be

$$\frac{130}{115} \times 0.52 \times 178 = 106 \text{ lb.}$$

Plus 25 per cent excess equals 132 lb.

Oil Required: The oil required at a consumption of, say, 0.028 lb. per b.p.h. hour would be

$$\frac{130}{115} \times 0.028 \times 178 \text{ lb.} = 3.3 \text{ lb.}$$

Plus 50 per cent excess equals 6.45 lb.

These figures should then be checked with the capacity of the tanks.

Weight of Crew: Taking for example, a single motor, the weight of pilot in flying kit equals 170 lb.

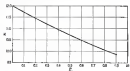
This leads to the completion of Column 9.

The horsepower assumed for the engine should be taken from an engine bench test, the full normal power being allowed. It is quite probable that over-revving

will occur by fitting special propellers, but so the fitting of a different propeller would constitute a modification from the type this is required to be stated on the Entry Form. This in turn allows the necessary allowance to be made in the power figure.

The wing area (Column 11) is also given on the Entry Form and from Columns 9, 10, and 11, the power and surface loadings called for in Columns 12 and 13 can be filled in.

With this information, it remains to carry out a performance estimate, usually at different weights, in order to form a correct prediction for the speed on the straight, which should be filled in in Column 14. The various



Handicapping Formula for Airplanes

$$T = 100 \times \frac{W}{S} \times \frac{P}{V^3}$$

W = handiweight used in match W = 170 lb. for all pilots
 S = wing area in sq. ft. with water, fuel, oil, and crew
 P = horsepower assumed for the engine
 V = speed in m.p.h. at which the engine is assumed to operate
 T = handicap value given to pilot in match. The larger the value of T, the more disadvantageous the match.

methods of obtaining a true speed estimate are all applicable and may be employed according to the requirements of the particular case.

First Method: If a rough estimate is required, curves of speed against pounds per horsepower obtained empirically from results of trials of various machines can be used, suitable corrections being made for the loading per square foot.

Second Method: If previous actual performance results of the same type of plane are obtainable a performance reduction calculation can be carried out for the particular conditions existing.

Thus changes in weight, horsepower, streamlining, etc., can be allowed for and adjustment made to the existing figures.

In making adjustments to known speeds for various differing conditions experience is at the greatest value. For this reason the "benchmark" column of Table I should be entered up with details as to accuracy of course and height flown, radius of turn at turning points, condition of motor, weather conditions and direction and force of wind. These are for use in handicapping the race or

Table I—Handicap Estimates

Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9
Engine or Identification No.	Altitude	Engine	Propeller	Wt. of aircraft (empty)	Wt. of crew	Wing area	Wing loading	HP assumed
Col. 10	Col. 11	Col. 12	Col. 13	Col. 14	Col. 15	Col. 16	Col. 17	Remarks
10-11-12-13-14-15-16	10-11-12-13-14-15-16	10-11-12-13-14-15-16	10-11-12-13-14-15-16	10-11-12-13-14-15-16	10-11-12-13-14-15-16	10-11-12-13-14-15-16	10-11-12-13-14-15-16	10-11-12-13-14-15-16

Table II—Adjustments for Meteorological Conditions

Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
Direction or Altitude	Temperature	Pressure	Wind speed	Wind direction	Time of day	Time of day	Time of day	Time of day	Time of day	Time of day
Direction or Altitude	Temperature	Pressure	Wind speed	Wind direction	Time of day	Time of day	Time of day	Time of day	Time of day	Time of day

similar machines in future events. Any adjustments to streamlining from standard should also be noted.

Thus, from an examination of the results of previous races one is able to make definite allowances for such points, and by the experience thus built up one is able to form a fairly accurate opinion as to the value in miles per hour of such changes. Thus taking as an example a small open-cockpit two-seater, such a machine without passengers, with one cockpit deleted in and its windshield removed, would give a handicap allowance of the order of 3 m.p.h. to another machine of the same type with an cockpit open, with windshield in place and carrying a passenger.

Third Method: There is always, of course, the "dash horse" and in air racing this is complicated by the new machine of novel design whose actual performance is unknown.

In this case recourse has to be had to estimating, and a complete performance calculation is the last of the handicapper's job. Indeed it is the only method available for ships of an entirely new type which appear for the first time in an event to be handicapped.

Speed estimates obtained by these methods are (unless based on previous results for the same or similar course) figures for straight speed; it therefore becomes open to us to adjust the figures so obtained in order to get the course speed.

Briefly, this is a question of relative speed in getting round corners and maneuverability of the various aircraft concerned in the calculation.

The whole of the above work is normally completed well before the day of the race, for in some cases it has been found advisable to publish the handicap allowance a day or two before the commencement of the race itself. The disadvantage of this course of action is that no allowance can subsequently be made for meteorological conditions, while instances in which aircraft are found to differ from the information given in the Entry Form become the subject of conjecture since on the part of the contest committee rather than a matter for adjustment on the field by the handicapper.

Usually the handicapper assumes normal weather with a light breeze blowing according to the prevailing wind for the region, and he brackets a prayer of thanksgiving on the day of the race if his "best passenger" has been fairly accurate.

In the general case handicap allowances are not published until the morning of the race, and this enables the handicapper to make adjustments to the handicap allowance for the actual meteorological conditions obtaining on that day.

In this case the slope of the course has necessarily to be taken into account in conjunction with the direction and force of the wind, unless for the sake of simplicity a circular course is assumed.

When adjustments on account of weather have to be made, a second Table (Table II) becomes of use.

In this table the speed already obtained and shown in Column 15 of Table I is used as a basic figure subject to further adjustments.

The time for one lap (Column 1) is of course a matter

of simple arithmetic and is quite useful as a basic figure for estimating hand handicaps for several races during the same afternoon which are run at the same course, but which comprise a different number of laps.

Correction for wind are somewhat difficult to carry out rapidly and it would strongly advise entrants unless the weather conditions are such as to make it reasonable these adjustments.

In the event of their being required, however, wind charts for the course can be plotted out in advance for various wind directions and strengths, if the shape of the course renders the assumption of a circular flight path undesirable.

On the morning of the race, direction and strength of the wind is obtained from the Meteorological Office and the time per lap for machines of different speeds can be read from the plotted curves.

This can then be filled in in columns 4 and 5 (as for example—Column 4 for 30 m.p.h., and column 5 for 20 m.p.h. wind). Then, if the actual wind just before

ENTRY FORM

Important Notes

- This document is important for the entrant's record and should be kept in a safe place.
- Entrants will be accepted unless this form is completed and filed in the office.
- Entrants will be accepted unless this form is completed and filed in the office.

Name of Entrant (in full) Maiden
 Name of Entrant (in full) Maiden
 Address Telephone
 Air Ministry License No.
 Total number of laps
 Time of race (in minutes)

PARTICULARS RELATIVE TO THE ENTRY

Machine
 Type Governor Mark
 Make Year No. No. No.
 No. of laps No. of laps No. of laps
 Total time of race (in minutes)
 Weight of complete aircraft (incl. fuel) lb.

Time Mark Register No.
 Name of Entrant (in full) No. of laps
 No. of laps No. of laps No. of laps
 No. of laps No. of laps No. of laps

Design No. (Number
 No. of laps No. of laps No. of laps
 No. of laps No. of laps No. of laps

Previous British Race Records in which the aircraft has competed during 1939

No. of laps No. of laps No. of laps
 No. of laps No. of laps No. of laps

No. of laps No. of laps No. of laps
 No. of laps No. of laps No. of laps

No. of laps No. of laps No. of laps
 No. of laps No. of laps No. of laps

No. of laps No. of laps No. of laps
 No. of laps No. of laps No. of laps

No. of laps No. of laps No. of laps
 No. of laps No. of laps No. of laps

the race is, say, 15 m.p.h., Column 6 can easily be completed.

Column 7 can also be filled in on the day of the race, since until the wind direction is known the conditions of take-off cannot be fixed.

It, for instance, a full-circuit of the aerodrome has to be made (because of the wind), before the machine starts its first lap in the geographical sense, the allowance can be made for the extra time taken. This allowance is of particular use in short races. [It will be noted that this applies to races in which the time is taken from a standing start on the ground, and not, as is usual, American practice, from the crossing of the line in flight. If the machines are to be started at their handicap aerodrome, as is done in Great Britain, ensuring that the first plane across the finishing line will be the winner, the standing start must be used, for otherwise the starting time cannot be accurately controlled.—Ed.]

Usually, accurate piloting still is essential throughout, as the machine is used and the machine becomes lighter as a gradual ascent is spent, but this of course is a very small point compared with the other variables, and estimates are normally based on a constant lap speed.

This in turn allows the total time estimated to be required for the race to be filled in, in Column 7, and by subtracting the actual handicap allowance can be filled in in Column 8.

Further, if the race is due to start at a given hour, Column 9 should be filled in, and this enables the necessary information to be given to the starter.

Theoretically the handicapper's task is completed with columns 6 and 9, but in actual practice he finds from an official examination of the competing ships before the race that differences occur between the airplanes themselves and their declared conditions on their Entry Forms.

Discrepancy is here required, for not infrequently, owing to loose or inaccurate descriptions of power conditions and alterations to streamline some action has to be taken, and it depends largely on the handicapper as to whether, in fairness to other competitors, the offending entrant is disqualified or his handicap allowance readjusted to cover the particular points in question.

Such readjustments call for a certain amount of expe-

rience, and are usually made in terms of the estimated effect of the change in m.p.h. and then translated into differences on the handicap allowance.

(b) *Automated Circuit Races* Exactly the same methods as described above may be used for the automated circuit races, but obviously in this case estimates for lap time need not be given into.

In both cases in the Kings Cup and Aerial Derby (run over air-city courses of several hundred miles—Ed.) the handicaps are published several days before the race, and it thus becomes impossible to make any detailed wind allowance. For the same reason the conditions of take-off



ABOUT THE WINGED WARBLER: Built in the manner in which the modern biplane is built, the 'Winged Warbler' is the first biplane produced in the modern days—handicapped the first biplane produced.

Below: An Airco Ace leading the parade at an English Air Day event.



The start of a private owner's light plane race at Bournemouth, England.

may only be settled on the day the event takes place, since the direction of the wind is not known.

What, however, at first appears to be a disadvantage is really without importance, as any allowance on such a score would be quite negligible for long distance races around a closed circuit.

This form of handicapping has during the past decade produced under interesting results, and has been widely used in England, where short-distance racing has become a most popular weekend sport.

Air races must have been held in various parts of the country under the auspices of the Royal Aero Club, and have been widely supported by flying clubs and private aircraft owners on Great Britain.

Care 2, Handicap on Formula

Up to the present the Kings Cup Race of 1936 and 1937 have been the only races run on formula handicaps in England.

The formula applied in the 1936 race was quite complex and involved the estimation of drag coefficients and propeller efficiency.

The speed obtained from the formula [see page 397] was used for handicapping purposes without any adjustments whatsoever.

It was hoped by taking less account in the formula those features which might be considered as more or less fixed for the designer, to award the prize to the aircraft of the ship which was cleanest aerodynamically.

The results of the race showed clearly that this formula was not suitable for application to a race in which a large number of different types of craft compete.

In 1937 a much simpler formula was evolved by the Society of British Aero-Engine Constructors (see the cover photograph herewith).

This was used in the Kings Cup Race of that year, but the results tended to show that better results would have been obtained if a higher value for the constant K had been used.

It was also suggested that the correction applied in the case of air-cooled engines should be omitted, and that measurements were unduly handicapped by the adjustment of wing area for lightness as laid down in the formula.

In 1938 the question again arose as to whether the race for the Kings Cup should be handicapped on a formula basis or by personal judgment, and it was decided

at a meeting of the Royal Aero Club Committee that the latter method should be used.

From the limited experience gained up to the present time handicapping on formula has not proved a success and it remains to be seen whether a variable formula, involving no systematic assumption in its application and applicable to various and divergent types of airplanes, can be evolved.

Personally, I am of opinion that formula handicapping will not prove of value for any race in which a large number of different types of airplanes compete, and prizes are offered sufficiently attractive to encourage aircraft manufacturers to design and build machines especially to beat the formula, and even in this case the frank machine may possibly be encouraged unwittingly.

Moreover, if such a formula is evolved, I would suggest that it should not be a standard sufficiently high to allow it to be retained for a fairly long period without modification, so that by an application general design for racing may be improved from the aerodynamic viewpoint.

A Suggestion

From a consideration of the whole question and a full realization of the various difficulties which are linked up with all the forms of air race handicapping so far used, it appears that in so far as sporting "close finish" races are concerned, excellent results might be obtained by the wholehearted co-operation of the competitors.

Then it is more possible for each competing aircraft in racing conditions to be flown over an approved speed course by a pilot circulated for the purpose, the results would fairly eliminate all possibilities of human error in regards the personal judgment of the handicapper and secondly would go far to dispel the prejudice or race results by the extremely close finishes which would be obtained.

It remains to be seen whether such a scheme is practicable, but I feel that the wonderful solutions for aviation coming today in the United States of America, coupled with the undoubted attendance of the American public, afford a marvelous opportunity for air racing to be put on a basis such that the finest possible results may be obtained and the interest of the great American people brought to bear on a sport which is bound to leap forward to the place it justly merits within the next few years.

WHAT RACING DID FOR THE *Italian* INDUSTRY

By COMMANDER SILVIO SCARONI

Chief Inspector Air Force, Air Attache to the Italian Embassy in Washington



Commander Silvio Scaroni

I STRONGLY BELIEVE in the advantages the race brings to the rapid technical development in aeronautics, and I am glad AVIATION asked me to say something on what racing did for the Italian industry.

But when talking about race, one has to make a distinction, as there are two entirely different kinds of racing. One consists in taking a few planes out of a military squadron, "grooming" them up, taking away all the unnecessary load for the race, like armament, radio, etc., pushing up as far as possible the compression ratio of the engine, sometimes going as far as cutting off a bit of each wing, and so on. Designers and engineers have, naturally nothing to do with this kind of work. It is generally done by the mechanics themselves in the plant set up for small repairs to the squadron's airplanes.

Such races have, if any significance at all, a purely sporting importance which does not go beyond the "prestige" of the squadron which wins the race, and serves no really useful purpose. It gives a pilot the chance to get a medal, or a squadron the chance to get a trophy.

Nothing available all the way a government can afford, putting together all the "engineering brains" of the nation, giving the pilots a careful training, together with a good preparation in all details, that is what I call real racing, even if sometimes the event is not a race in the true sense of the word, as, for instance, when it is a question of a long-distance flight, an altitude record, and so on.

To me it seems impossible to reconcile the attitudes of those who are enthusiastic about spending a lot of money on all kinds of experiments in the laboratory, even for the most fantastic ones, and who at the same time deny a reasonable amount of money for racing. Of course, I am not talking here about my particular country. I have observed the same phenomenon wherever I have gone to study aviation.

When I used to take part myself to the kind of "Trentford model" described above, and which were representative also of the international races about which America won the Schneider Cup from England in 1931, I am sure that I, too, did not believe much in racing. I could not see then the advantages of racing, since it was

generally a question not of bettering design, but making an already existing machine faster for any practical purpose. The result was null from the technical standpoint, and inevitably limited to a few citizens in the sporting section of the newspaper, a language with a lot of "after dinner speeches" on the splendid qualities of the winner, and the tremendous future of aviation, and sometimes a sweet smile from a beautiful girl who got suddenly enthusiastic over your temporary popularity.

The comparative uselessness of these races is evidenced also by the fact that in the first years subsequent to the war the so-called "racing planes," which were purely military planes taken out of the stocks left over from the war, did not increase their speed, in three years, from 1919 to 1921, by more than 10 mph.

IN RACE, in 1919 the speed of the planes at the Schneider Cup races in Venice was a little over 100 mph (This race was essentially because owing to the fog no competitor covered the correct course.) In 1920, the winner averaged 106.7 mph and in 1921, the Belgians, on a March 2 Flying Boat, won the race at 110.9 mph.

It is clear that from the technical point of view races of this kind were practically worthless.

Only the following year, England made a real improvement with a new machine and a new engine, when she pushed the record up to 149.7 mph, which meant a jump of 35 mph.

But England knew what that improvement cost her. It was no more "vacuum business"; it was money, study, research in a word real preparation for racing.

In 1923, Rittenhouse covered the course at an average speed of 177.30 mph, that is another 33 mph, more,



March 2 airplane in which Major de Boremeil won the Schneider Cup Race in 1923 with a speed of 149.7 mph.

but the machine was not a war machine, neither was it fitted with a new engine.

It was not the work of squadron mechanics, but a real engineering job.

The shock of this victory was felt in Europe, and also was so little prepared for a real race that in 1924, the year after Rittenhouse brought the Trophy to America, the could not come to the United States, as she had no plane nor engine to compete with the Curtiss.

Curtiss, as an aeronautical constructor, was very little known to the average European, who knew about those races in American aviation, "Liberty Engine," "Martin Bomber" and (you, why not say it?) the "Bullfinch Bomber," the size of which struck his imagination.

The American pilots, too, had had very little opportunity to show

Europe what they were worth, with the result that Europe was perfectly convinced that actually her superiority there was not much worth considering in this field.

That, of course, was long before Lindbergh, Byrd, etc., had made their splendid flights across the Atlantic with American engines and planes.

I think now one can deny that America gained a tremendous prestige as the war when one of its citizens put up so remarkable a performance as did Rittenhouse in England. The prestige in itself may amount to little, al-

though, no matter what may be used to belittle it, it is always convertible into real money for an industry.

But the American victory at Rome started a fire between all the air-minded nations of the world which is still burning stronger than ever. The feeling that holds all the aeronautical world waiting for reliable news about the new planes which will participate in the Schneider Cup Race has never been so great as it is this year.

THE world is anxiously waiting to see the results of the efforts made in the last two years by all the aeronautical powers of Italy, America, France, England, in a word all the great airplane-producing nations of the world with the exception of Germany.

All that interest is purely due to the races.

Now one may question the value of the technical improvement and the utility of these improvements in so far as their practical application to commercial and military aviation is concerned. (These points are examined soon by M. Lightham and Commander Wind in their article, and also by correspondents Dawson and Ingalls—Ed.) Such matters can be discussed for months, but I am writing on what racing did for the Italian industry.

Here is a piece of "old news" from an American publication written the day after Italy won the Schneider Cup. Said the "Air Corps News Letter":

"The victory of the Italia flyer is all the more remarkable when consideration is taken of the fact that it is the Schneider Cup Race held at Baltimore last year the Italian entry, a March-Curtiss monoplane, piloted by Luca De Boremeil, was repeatedly outdistanced and attained an average speed of but 108 m.p.h. This speaks volumes for the wonderful progress made by Italy in the short space of one year in the matter of airplane development."

But even those 108 m.p.h. were obtained with a foreign-made engine, as at the time we had nothing better to show.

In December, 1928, the Italians were

Commander Silvio Scaroni is qualified to write with authority upon what racing has done for the Italian aeronautic industry. He was among Italy's leading aces, has been his country's Air Attache in London, and is at present Air Attache to the Italian Embassy at Washington. Commander Scaroni points out in a most striking manner, with illustrations from recent experience, how the development of a successful racing plane is attained by "putting together all the 'engineering brains' of the Nation" backed by sufficient funds, and by careful and specialized training of personnel.

still looking for an engine to use in the 1928 Schneider Cup race.

Then they started thinking seriously about racing, and they obtained results to hope for which would have seemed optimistic even to an enthusiastic race.

The Italian Air Minister, H. E. Mussolini, called together all the aeronautical "engineering leaders" of Italy, and promised all the money necessary for the development of plane and engine.

On Feb. 4, 1928, the engineers of the Fiat began working on the design of a new A.S.2 motor, and its construction was started on Feb. 13. On June 24 the first test of the first four engines in construction was successfully carried out.

On its part, the Macchi on March 25 began the design in detail of the airplane, and on April 18 its construction. (These figures are the official figures given by the Macchi and Fiat companies.)

In November of the same year this plane and engine won the Schneider Cup at Norfolk, Va.

In December, 1928, a very well-known American firm was asked to construct for the Italian Government the engines to be used in the Schneider Cup race. With a letter dated Jan. 6, 1929, and firm answered that it could not build the engines, as the type asked had been developed in co-operation with the American Government.

Although we were far behind the leading countries in

engine construction, in about nine months, just on account of the race, we succeeded in building an engine which was considered at least one year ahead of all the aeroplanes existing at the time.

This engine had a weight of one pound per h.p., although it had a compression ratio of only 6:2:1, and we could therefore use ordinary fuel (kindly furnished to us by the Naval Air Station at Hampton Roads) in the proportion of 80 per cent gasoline and 20 per cent benzol.

USUALLY people look at the plane to determine the amount of progress made in aviation, and few seem to give much importance to the engine, but it is the engine which has made the most wonderful progress, thanks to the race.

People say that such speeds will not be practical for commercial or military planes and that after all the plane, except for an improved atmosphere, is more or less the same as it used to be years ago. And the same people tell you also that such an engine is in use in the state in two words: it will not stand the strain of long flights.

Well, I grant these people that the plane is still made of forgings, wings, tail and undercarriage, and that the race have left it fantastically what it was 25 yr. ago.

This is only in part true; nobody will deny, for instance, that the Caproni piston plane, which is today the

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standard equipment in the military organization, has a lot to do with that other Caproni product which won the Schneider Cup at Cowes.

And, again, I will never forget the tremendous tests on the basis of several engines when for the first time they set their eyes on the Macchi plane in the hangar at Nordde.

In 1925 England brought to Baltimore a monoplane with non-motivated wings of this section, which crashed on the first trial because the wing was not strong enough to stand the strain of a 45 deg. turn. That kind of construction, said some newspapers at the time, "is criminal."

An expert when I had the pleasure of showing around the hangar at Nordde, pointed to one hand and slide rule in the other, demonstrated to me that the Macchi semi-



Macchi-Caproni monoplane entered by Italy in 1929
Schneider Cup race

fixed (a world's record which still holds good) there were incorporated all the improvements gained in building and running the Fiat engine which won the Schneider Cup at Norfolk.

At the end of 1928 the whole Italian industry could not give the Government a single engine and plane for the most important international race. For this year's race, not only the Fiat, but the Isotta-Fraschini, too, have built engines which will compete not only the Macchi, but two other Italian firms as well, are building planes for this event.

And that the technical knowledge acquired in building these planes and engines can be exploited, at least in part, for practical use in military and commercial planes, few people can deny.

That an entirely new plane and engine, which have made a few trial flights and even won a race cannot be put, the day after the race, in a squadron as a standard type, or on an air line as a paying job, is such an evident truth that no one can seriously question it. But, on the other hand, having in five years (1920-1926) brought up the speed of a plane from 110 m.p.h. to 246 m.p.h., and having brought down the average weight of the engine from two pounds to one pound per h.p., is a real success which can hardly be denied.

One knows at very often and that the stage of technical development reached in the racing machine is already too much ahead of what we can practically apply to commercial and military planes.

One hour it and also that the amount of money needed now for the construction of new planes and new engines for that purpose is not justified by the result we may hope to obtain either from the technical or any other point of view.

I, for one, do not share this point of view, as I do not dare to fix any limit to human possibilities, least of all in the aeronautical field.

Remembering the statement above referred to that the "Italian entry, a Macchi-Caproni monoplane, was especially outstanding..." it is with pride, which I believe is justified, that I read in the "London Telegraph" a recent article which says: "The Italians are determined to conquer the Schneider Cup, and since an Italian plane holds the world speed record, they are to be considered our most formidable rivals."

This is what racing did for the Italian industry.



Walter de Braccio being checked on the direction of the movement after which the 1928 Schneider cup engine
Commander General stands beside him

centerline wing could not possibly stand the strain, as the flapping of the wing tip would certainly cause a disaster like the one at Baltimore the previous year.

The Macchi was the race, victory itself, and Germans made more beautiful hope to the amusement and admiration of both technical and non-technical people watching him from the ground.

But people still insist on giving almost all their attention to the plane and little to the engine.

AS LATE as 1925 there was no engine in the world which weighed less than 1.8 lb. per h.p. (dry) and the majority were as heavy as 3.3 lb. per h.p. Therefore for the Fiat to build an engine weighing only 1.3 lb. per h.p. was no small success.

To those who think that such engines are unreliable and cannot stand the strain of long flights, I will simply remind them that in the Fiat A-321 aero-engine, which was installed on the plane used by Major Ferrara and Del Piero for their long-distance flight from Rome to



Nine Years

OF NATIONAL AIR RACING

By JAMES P. WISSE

OF THE thousands of persons who are expecting to witness the first National Air Races in Cleveland this week, few know the origin of the various events, or the reason for them. Even among those within the industry, the difficulties are perhaps the only ones that will recall why and when and how the races were started, to supply the stimulus given in the last three years. Yet the history of the National Air Races is important. Their growth marks very clearly the development of commercial aviation in this country, and it records the progress that has been made in the design and construction of aircraft and engines.

When the United States entered the War, a tremendous demand was placed upon the aircraft manufacturers. As a result, new factories were created, and they were expanded until the country had a real aircraft industry, but it was founded almost entirely upon war-time contracts—a very narrow basis. There was no commercial aviation activity. We had a tremendous investment in a machine that had no possible outlet for its product other than sales to the Government.

With the cessation of hostilities and the abrupt termination of the Government contracts, the manufacturers found themselves in an almost hopeless position. The public had accepted aviation as a military tool, but it was far from ready to accept it as something that could be used to advantage commercially. Its acceptance in that could only be brought about slowly by education.

The demand that there was for planes to be used commercially was readily supplied by the surplus of war-production machines. The races immediately following the War were extremely lean, and in fact, had it not been for some of the pioneers who believed in the future of aviation and worked to develop it more for the love of the game than anything else the United States would not have the aircraft industry it has today.

It was in the summer of the last year that the National Air Races—started to encourage competition in design among the manufacturers and to arouse the interest of the public in flying—had their beginning. True, the series of races did not take its present form until 1933, when it was called the "International Air Races," much in the same manner that the first airshow show of the Aeronautical Chamber of Commerce in Chicago last December was known as the "International Aeronautical Exposition," but the principal events originated in the first years after the close of the War.

The Pullman Trophy, donated by Ralph, Herbert and Joseph Pullman, Jr., one of the mainstays of the air

shows, was first contested for in 1920. However, the national series was held actually for the first time in 1923. A number of aviation events were conducted in various parts of the country in that year, and some of the events held were later incorporated in National Air Races, where they still survive as aeronautical classics.

The greatest series of races in 1923 was to have been held at Selfridge Field, Mt. Clemens, Michigan, September 8-10. In that meet it had been planned to include the second annual race for the Pullman Trophy. For the purpose of conducting the meet, the Detroit Aviation Society was incorporated and an elaborate program was arranged. A main event was scheduled as



Left to right: James O. F. Moore, General Peckham and Herbert Peckham standing by the Pullman Race at Selfridge, D. C., in 1923.

a non-homogeneous race for multi-engine planes with large load-carrying capacities and with high speeds in excess of 75 mph. Note that figure well, as a mark of eight years' progress in transport types. The course was to be 250 miles in length, and the rules provided that the planes were to be passed at an altitude of not more than 400 feet, but on each lap the planes had to pass over a capture balloon 6,000 ft. in the air.

The second event was planned as a race for light commercial planes good for speeds of more than 30 mph. The course and the rules were the same as in the first event, but the winner was selected on a basis of points earned. Six hundred were to be granted for finishing first in the race, while other points were to be given on the basis of proficiency both for the shortest take-off and landing run and the greatest range in speed. Bonuses in points were also provided for roll-overs, for

roll-overs, and the accessibility to oil, water and food tank caps, as well as chain plugs, glowing screens, ignition breakers and distributors. That marked the first attempt at planning a general commercial efficiency contest.

The same rules applied to the third event scheduled, even to choosing the winner, which was for Zoner planes of the observation type, having high speeds of over 100 mph. The fourth event was the Pullman Trophy Race, at that time a two-lap race for planes capable of traveling at least 140 mph. That race was to have been four laps around a 40-mile closed course. For the four events, there was to have been awarded a total of \$10,000 in cash prizes.

The Detroit meet would have been one of the outstanding events of the year, but late in July the Detroit Aviation Society announced the postponement of the races until 1925 as a result of its inability to obtain assurances of Army and Navy interest. The lack of funds was given as the reason for the non-participation of the service, and the races were cancelled because the service entries were being depended upon to provide competition.

However, there were races elsewhere. On September



A plane crossing the path of the 1939 National Air Races.

5 there was an OX-5 powered "Jenny" race at Chicago, Illinois, with eleven entries. A flying meet held at Kokomo, Indiana, Sept. 24-25 under the auspices of the Curtiss-Johnson Company was reported to have drawn out a total of fifty planes, most of them, no doubt, the ubiquitous JN.

The next event on the aeronautical calendar was "Aviation Day," October 16, at the then Cerritos Field, Garden City, Long Island. It was distinguished by a demonstration of the advantages of an transport. The Wright Aeronautical Corporation donated a trophy for this affair, which was for both land planes and seaplanes and was curiously indefinite in its nature. Each entrant had to make a flight of his own choosing within eight



A section of Cerritos Field, scene of the 1939 National Air Races.

hours, and then was required to cite the advantages, assumed to be time, money, or by any other means, of air travel over all other forms of transportation for the flight that he made. The competition presented no strenuous problem for the judges.

THE LAST RACE of 1921 was featured by two outstanding aviation events. The first was the *American Legion Flying Meet*, held in conjunction with the Third Annual American Legion Convention at Kansas City, October 31 to November 3, and designed to show the progress of aviation since the close of the World War. Among the events was an altitude competition won by Lieutenant Wendell Brodsky, U. S. A., in a DH-4B powered with a Liberty engine. He reached an altitude of 24,850 feet with Sergeant Rauld Chambers as passenger. At that time records for altitude were held by a German gasplane (pneumatic jump), by Sergeant Chambers "went over the side" with a parachute when Lieutenant Brodsky had reached his high altitude mark, thereby winning a cup for the highest parachute jump.

Other events included an exhibition of commercial sport model planes. Incidentally, my personally owned open-cockpit plane was considered a sport model. The planes took off singly and were put through any manuever, close at altitude of 1,000 ft.; that the pilots tried to perform with a view to showing the crowd, spectators, judges and spectators their craft. The event was won by Ralph P. White in an SVA-9 powered with a 225 hp SVA engine, a slightly modified Italian military plane. There was also a relay race for Jimmie and "Candace," with four planes in a team. One at a time, they took off from a standing start, flew around a 60-foot circle triangle course, landed and taxied to the line. Then the next plane of the team would take off.

"Cory" Jones, now the president of Curtiss Flying Service, Inc., was the "Legion Junior Derby" for pilots of any type with a high speed race than 100 m.p.h. He flew his C-6 powered, Curtiss "Orion" five laps around the 17.1 mile course at an average speed of 59.3 m.p.h. That was the first appearance of a machine late to become famous in Mr. Jones' hands. N. D. Treadwell was the lapsing master by making 36 consecutive laps with a Longport plane powered with a 60 hp Lawrence L-2 engine and having a streamlined nose (aerodynamic frigate), while Lloyd Burton finished first in the Legion Derby with his 400 hp Curtiss powered, Aeroflight built, at an average of 120 m.p.h. on a mile-and-a-half course. Among the other events were formation flying by Army and civilian planes, a parachute drop from a native balloon, a steeple chase, plane changing and wing walking, an endurance race over a minimum distance of 600 miles, and an efficiency contest for several carrying five or more passengers. The latter event was awarded to include expense and fuel charges. The personal element was much to the fore.

The second race in the late fall of 1921, and the last race of the year, was the *Deloitte Aviation Derby*. It was in conjunction with the International Aero Congress. In a sense the culmination of this event with the one at Kansas City marks the real beginning of the National Air Races. The principal feature of that affair was the second Pulitzer Trophy Race, which the Detroit Aviation Society had taken over from the Aero Club of America. In a sense the same was as in 1920. The pilots entered had to show a speed of at least 140 m.p.h., while the pilots were required to hold F. A. I. license and to be entered on the register of the Aero Club of America. However,

the course was changed slightly, to five laps of a 31-mile course. Bert Austin piloted his Curtiss Navy racer, powered with a CD-12 engine at an average speed of 197.7 m.p.h.

Many of the planes that took part in the American Legion meet at Kansas City were flown to Omaha, where they were entered in the various other events held there. Mr. Jones was again with his C-6 Orion. He flew a 90-mile course in 35 minutes and 44 seconds in a race for C-6 and K-6 Curtiss Orions, Hispano-Suiza powered Jewells, Laird "Swallows," C-6 and K-6 Standards, and in general any machines with high speeds of from 75 to 90 m.p.h. in a race for Jewells, Jewells, OX Orions, OX Standards and other planes with top speeds of from 60 to 75 m.p.h. F. M. Deschamps piloted his OX Oriole to victory by covering the 90-mile course in 59 minutes and 4 seconds.

There was also a contest at Omaha for the *Larson Efficiency Trophy*, which was donated by John M. Larson. It was awarded the plane demonstrating the highest efficiency factor (E) according to the formula:

$$E = \left(\frac{W}{T} \right) S$$

in which W was the total weight of the plane leaving the ground; T, the weight engine; G, fuel consumption during the flight; and S, the average speed in miles per hour made over the course. The Aero Club of Omaha likewise specified that the entrants must have a minimum speed of not less than 60 m.p.h., and must be able to carry a pay load of 400 lb. A maximum factor of safety of five for construction and four for design was required. The course flown was 950 miles in length. On leaving the finish line, the planes had to climb to an altitude of 5,000 ft., marked by a square balloon, and then land in a predetermined area. This event was won from a field of 18 entries by Mr. White, with the SVA-9 in which he had captured the trophy for open planes at Kansas City. The awarding of the Larson Trophy to Mr. White, though, was later protested by the donor, who had also had an entry, on the grounds that SVA-9 made use of a counter engine fuel tank, and a long and acrimonious dispute resulted.

THE NEXT important occurrence affecting competitive racing, and their management was the inauguration, in January, 1922, of the Aero Club of America and the National Air Association, which had been formed at the International Aero Congress in Omaha. This was followed in May with the announcement of plans for the formation of the present National Aeronautic Association during the week of racing to be conducted by the Detroit Aviation Society in the fall. The same day, Rear Admiral W. P. Pollock, U. S. N. (Ret.), was making a tour of the country in an effort to organize states and districts on the behalf of the new association, which was to be known as Colonel Harold E. Hartney was also active in the preparation for the representative meeting. Incidentally, it is interesting to note that the first problems with which the Aeronautic Association planned to cope were those of controlling the race caused by the approval of the public to capture flying, and the lack of legislation governing aeronautic activities.

Society had taken over the National Aero Congress, however, several important aviation events were held. On April 29 and May 6 and 7, for example, the American Legion conducted a flying meet at Wabash, Pa., Tenn. The events on each of the three days being opened with a



Edwin C. Curtis in the cockpit of his OR-12 Puller. This winning Curtiss biplane.

formation flight over the city. The first day, the formation flying was followed by what was known as the Curtiss 30-mile race. After this came a 5-minute altitude climb for government planes, a shooting exhibition by Army Air Corps craft, wing walking, a race for Laird Swallows and Lincoln Standards, a free-for-all altitude course, and a parachute sport landing contest over an altitude of 1,500 ft. The program for the second day was practically the same as that for the first. The third day, however, there was a free-for-all handicap race, a looping contest and a contest for upside down flying, in addition to parachute jumps and the formation flight over the city.

It has been generally true throughout racing history, that it was in 1921, that the most spectacular and sensational events have been provided by the military and naval services. For example, an aviation meet was held at Legion Field, Baltimore, Maryland, Memorial Day, 1922. There were a number of civilian races and contests, in which some 35 planes participated, yet the most interesting event from the point of view of the spectator was agreed to have been the bombing of a wood and tarvac "kist" by a number of Army planes. At the National Air Races last year, however, the Navy's "San Elmo" and the Army's "Three Mothers" almost monopolized the public interest except for a few brief periods.

The most event of importance on the 1922 schedule was at Mountville, Illinois, June 15-17. Thirty-two planes competed in the various events, which included several races, an altitude contest, a parachute jumping contest in a spot landing, a dead-stick flying contest in which the last plane to land was and a shooting and descending contest. This meet was noteworthy for the demonstration of various types of aerobics. The government announced that there would be no plane changing or wing walking exhibitions. Public interest in such performances was fortunately dying.

So we come to the Detroit Aviation Meet, which was opened October 7. For the first time, National Air Races were to be held on a large scale and as a connected whole. The meet was, of course, conducted by the Detroit Aviation Society, and was held at Selkirk Field, where it had been planned to hold the races the previous year. The third race for the Pulitzer Trophy was in-

cluded as the principal feature, with a number of others as a setting for the trophy competition.

However, it will be remembered that plans had already been laid for the formation of the National Aeronautic Association to replace the existing aeronautic bodies. According to schedule, this organization was now being at the business meeting of the unorganized Aero Club of America and the National Aero Association, held at the time of the Detroit races. The result was that the newly formed N. A. A. picked up practically the whole group of men in a body, and who conducted with others in 1923 under the auspices of the St. Louis Air Board and the Flying Club of St. Louis with the service of the Aeronautic Association, they became formally known as the International Air Races.

AT ANY RATE, six events were held at the Detroit meet of 1922. Five of them were won by aviation pilots, the sixth having been won by civilian entrants. The first event was known as the "Detroit Aerial Water Derby," and included the race for the Curtiss Marine Flying Trophy. The deed of gift had specified that the trophy should be perpetual, and that the annual races for it were to be conducted by the Aero Club of America, or any other aeronautical association assigned to the task by the Aero Club. This first race was eight laps around a 20-mile closed course, with the requirement that the planes had not and would some water controls on the 11th, 16th, 21st and 26th laps. The severity of making sharp turns while racing at maximum speed produced some very picturesque results, especially with the twin-draft machines. The event was won by Lieutenant A. W. Gougeon, U. S. N., with his Navy Curtiss seaplane powered with a J-3 Lawrence engine, one of the fastest of the present Wright "Whirlwinds," at an average speed of 122.16 m.p.h. The Curtiss Trophy race was achieved with the others by the N. A. A., but because it was a water event it has been conducted apart from the National Air Races. The second event at Detroit was a race, 10 laps around a 20-mile course, for the Duesse Navy Aerial Mail Trophy. This race was supposedly intended for air mail planes, but the possible thing about it was that all the mail planes at that time were DGHs, powered with Liberty engines, while the rules for the race allowed the entrants to large mail-engineered machines. As a result, it might as well have been an Air Corps race. Four Marlin bombers and a Marine transport, belonging to the Army, were the only participants. The Marine transport, piloted by Lieutenant Erik Nelson, U. S. A., subsequently one of the members of the Army's Road-the-

World flight, was by making good an average speed of 105.1 m.p.h. over the course. Suddenly, this was one of the earliest airplanes going by any means with the plain cockpit fairly enclosed.

A race for "high" commercial planes for the Aviation Country Club of Detroit Trophy was the third event. The winner was the same as in the second event, and the race was won by Lieutenant Harold B. Harris, now of Pan-American Grace Airways, with the famous Liberty-powered "Honeydew Express," an extensively modified D55. The average speed made was 126.1 m.p.h. Lieutenant Harris intended his speed naturally by flying within a foot or two of the surface of the water on the part of the course that lay over the Detroit River, one of the first attempts that had been made to take advantage of "ground effect" in racing. The fourth event was the Liberty Engine Builders' Trophy Race for 2-seater planes of the intermediate type. Nine Army machines competed, and the winner was Lieutenant T. J. Koenig with a Lejeune, powered, of course, with a Liberty engine. The average speed maintained by the plane in the race was 126.8 m.p.h.

The third Pulitzer Trophy Race was the fifth event. It was won by Lieut. B. L. Maughan, U. S. A., who flew the Army Curtiss racer No. 2 in victory at an average speed of 206 m.p.h., with Lieut. Lester J. Marford, of the Army's Headquarters Flight at 1927, on a similar machine. The race was five times around a 50 km. (31.17 mi.) course. Both the Army and the Navy had become much interested in racing and had had speed machines built by a number of manufacturers, with the result that there was approximately twenty starters in the Pulitzer Race, a record never approached before or since. The sixth event was the "Owen-Dennis" Race, a free-for-all for civilian planes flying to Selfridge Field from points more than 250 miles distant. It is historically important, because it was the beginning of the busy trans-continental air service now held in conjunction with the National Air Races.

St. LOUIS, MISSOURI, seems to have the facility, so far as aeronautical events are concerned, of obtaining permission to hold the most important at an early stage of their existence. Since water, the most important aeronautical exposition will be held there, while in 1923 the city became the scene of the air meet.

The 1923 air meet went to St. Louis, and an expedition known as the St. Louis Air Board was organized to make the arrangements and conduct the meet with the aid of the Flying Club of St. Louis. To finance the event, it was proposed that a St. Louis Aeronautical Corporation be formed. Twenty thousand shares of no par value stock were to be issued and sold at \$10.00 a share.

Of the capital thus obtained, it was estimated that from \$30,000 to \$50,000 would be used for the purchase of land for an airport, that \$45,000 would be expended in making permanent improvements, and that \$11,000 would be utilized in prizes. The remainder of the sum was to be used for the actual expenses connected in conducting the air races. A site for the airport was selected at Bridgman, Mo., and the work on it was completed in time for the races, which were on for October 1-3. At that time, the field was said to be one of the best in the country, but evidently an drainage system was quite inadequate. The heavy rain that was experienced shortly before the races were scheduled made the field unsuit-



A Navy Wright Flyer ready to take off in the 1924 Pulitzer Race.

for operations, so that at the last minute the races were postponed until October 4-6. Highway transport between the city of St. Louis and the field was, and remained throughout, very good, and convenient.

The first race on the calendar was the "Owen-Dennis" event, which was completed before the air races proper were opened. Like the Owen-Dennis Race, it was for planes flying to the Bridgman field from a distance of more than 200 miles, and was open only to civilian planes. The awards were made on a basis of elapsed time, taking into consideration the distance, the horsepower of the engine and the number of passengers carried in each plane. "Curly" Jones again came in the front in this race, winning it by flying in a Curtiss Oriole from Garden City, a distance of 206 miles, in 33 hr. and 20 min.

The second event of the meeting and the first event of the air races proper, was a race for the Flying Club of St. Louis Trophy, it was open to civilian 2-seater planes, powered with 105-hp. or engines of lesser horsepower. The race was three laps around a 50 km. (31.17 mi.) course at a distance of 90 miles. Walter E. Lees, piloting an OX-5 powered Hamilton P.C.I., was the winner, averaging 90.41 m.p.h. The next race was for the Liberty Engine Builders' Trophy, and again it was won by an Army pilot, even though it was open to civilians. The winner was Lieut. C. McMillan, who piloted a Pulitzer CQM, equipped with a 450-hp. Liberty engine, averaging 91.1 m.p.h. The next closed course at an average speed of 129.03 m.p.h.

The Detroit Aviation Country Club Trophy Race was the fourth event held at St. Louis. The rules for the race, though, had been changed since it was first conducted in Detroit. In 1918, it was a handicap for commercial planes with top speeds of not less than 80 m.p.h. and with engines of not more than 750 cubic inches displacement, or approximately 200 hp. The regulations also provided that the planes entered in the race must carry at least two passengers besides the pilot. This event was won by Jack Atkinson when he piloted his Bellanca CF cabin monoplane, which was powered with a 90 hp. Anson engine. Five times around the 50 km. course at an average speed of 94.28 m.p.h. The characteristic Bellanca type, with wide lifting struts to the wing was making its first public appearance. Maintaining a speed of 114.28 m.p.h. over a 300 km. course was the Merchants' Exchange of St. Louis Trophy for Lieut. H. L. George, U. S. A., who flew a Martin bomber with two Liberty engines. This race had been scheduled for both military and civilian planes with carrying capacities of not less than 1,000 lb. Incidentally, the winning plane was constructed originally in 1919 for the Government

air mail work, and now some 130,000 miles of flying in that service before it was turned over to the Air Corps and changed into a bomber.

The Detroit Navy Air Mail Trophy Race, held for the second time, was restricted on this occasion to U. S. Air Mail pilots flying regular air mail service planes. The event was captured by J. F. Moore, who flew the repaired air laps of the 50 km. course in his DH-4 mail plane at an average of 124.98 m.p.h. The John L. Marshall Trophy, a perpetual trophy donated by Bing Co. William Marshall is brother of his brother who was killed overseas, was captured for by pilots of the Army's First Pursuit Group. It was previously a "non-stop" race, since the pursuit group was using Thomas-Morse MR-3's powered with 300 hp. Wright R-3 engines at that time. Capt. Stuart Shull was the winner, flying his plane 146.43 m.p.h. The Marshall Trophy, open to members of the Junior Flying League of the U. S. A., was another prize contested for for the first time in St. Louis.

As in the case of a number of the other events, the rules for the annual race for the Pulitzer Trophy were modified to a certain extent by the U. S. A. before the race was run off at St. Louis. A speed of 206 m.p.h. had been assumed the year before, and when it was learned that everything went black before the pilot's eyes in making a sharp turn at such high speed, it was decided to arrange the course in the shape of an equilateral triangle with double turns at each point in order to meet more water turns. The maximum high speed was increased to 175 m.p.h. also, and the factor of safety required for both monoplane and biplane entered in the race was raised to 7:1. The event, under the modified rules, was won by Lieut. "Al" Williams of the Navy, who flew the Navy's new Curtiss racer, powered with a D-2 speed, four times around the course at an average speed of 243.67 m.p.h. The Navy had had four new machines built for the race, two by the Curtiss and two by the Wright company. The Army had no new ships, but started those sent by Maughan and Marshall the previous year.

One of the very interesting points in connection with the meet in 1923 was the arrangement made to have all the pilots on the field take special racing tests, so that they might be classed according to their skill. The pilots passing the test satisfactorily were allowed to carry passengers at any time. Others were allowed to fly but

without passengers, while the least satisfactory were not permitted to fly without a qualified pilot. The plan worked very good, but civilian standing was promoted at a disproportionately low altitude. Another point of interest is the fact that a large net was strung on the flying field to break the occasional swiftness prepared by the Army and Navy and those of a few commercial experimenters. The U. S. A. held its annual convention in St. Louis while the races were in progress, a practice that has been followed since that time with one exception. The Army and Navy were still dominant in the competition at St. Louis, but the commercial participation was growing steadily more important.

WRIGHT WINGFIELD FIELD, Dayton, Ohio, was the scene of the 1928 National Air Races, which were held October 2-4, and included most of the events held at St. Louis the year before. In addition, there were some new events, planned with special reference to the interest in exceedingly light and low-powered planes which had grown out of glider activities in Germany and elsewhere. The first race was an "Owen-Dennis" affair, which was won by Mr. Jones, in association with his civilian-built biplane, with a C-6 powered, dubbed wing Curtiss Oriole. His winning of this race was rather amazing in view of the fact that he landed at Wright Field, after having flown from a point approximately 300 miles away, only to find the engine was actually dead just under the required 200 mile mark and that it could not be counted for that reason. As a result, he took off again, flew to Chassett Field, Bedford, Illinois, where it 255 miles from Dayton, and then returned with a good tail wind. The return flight was the race for him.

The second event, one of the new ones, was a race for a trophy offered by the National Club (Burgess Company) for 2-seater civilian planes with engines of not more than 510 cubic inches, piston displacement. Each of the entries carried a load of 340 lb. and was sent off from a standing start, making an circuit of a 14 mile closed course before finishing. This race was won by Mr. Lees with the same Hamilton P.C.I. that he had piloted to victory in the races the year before. His average speed was 95.3 m.p.h. This event was followed by a race for the Labaree Union of Aviation Trophy, which was won by the impeccable wife of Jones with his "dipped wing Oriole." The race was eight laps around the 15-mile closed course, and was open to all civilian planes, capable of carrying



Refueling in the 1923 Pulitzer Race lined up for the take off.

from two to four passengers and with engines of less than 800 cc in piston displacement. Mr. Jones won it by flying the course at an average speed of 125 m.p.h.

Gen. M. G. Duke, U. S. A., was the winner of the Liberty Engine Builders' Trophy Race, and set a new record of 130.34 m.p.h. with his DH. This race open to both civilian and military planes of the 2-inter observation type, had been restricted against wing-dipping by the additional requirement that the wing strut must total at least 360 sq. ft. The Dayton Chapter of Commerce Trophy, offered to the winner of a 150-mile closed course race for planes capable of carrying payloads of 2,000 lb. and with speeds in excess of 80 m.p.h. was won by Capt. D. M. Myers, who set an average speed of 220.83 m.p.h. with his Martin bomber. This race, which was almost identical with the one for the Merchants' Trophy, offered to the winner of the Merchants' Exchange Trophy in 1933, was another one of these events very effectively monopolized by the Army leaders.

The Detroit News Air Mail Trophy Race was entered at as event purely for air mail pilots. The race for the Mitchell Trophy, as always, was a military affair. The participants of the Curtiss PW-8 general plane, governed with Curtiss D-12 engines, and because it was a restricted race, the spectators found a case interesting that competitors for the Pulitzer Trophy. It was won by Capt. Cyril Betts, who piloted his plane four times around the 31.62 mile course at an average speed of 175.53 m.p.h. The Pulitzer Trophy event was the next on the schedule. The course and distance were the same as those for the Mitchell Trophy. Capt. H. H. Mills set an average speed of 215.27 m.p.h. and led the series at the finish line with his Verville-Sperry, which was equipped with a 520 hp. D-12A. It will be noticed that speed was less than that set by the winner of the 1933 race, no new machines had been built for the competition.

The Pulitzer was entered by the drunk of Capt. Scott, winner of the Mitchell Trophy the previous year, as the result of a straitened illness while diving for the steering line. Some of the events in 1934 were divided into two

parts, the winners being selected on a basis of both speed and efficiency. The event with the Detroit Aviation Country Club Trophy as a prize was one of these, as was the "speed and efficiency race" for light planes, one of the newcomers. The trophies for first were donated by the Dayton Flyer Club and the Engineers Club. The speed and efficiency race, like another light plane race that was run off for a trophy contributed by the Dayton Daily News, was not particularly satisfactory. The engine for the planes entered in these races were limited to 80 cc. in piston displacement, with the result that the entrants attempted to adapt motorcycle engines for use in these places. Reliability under airplane conditions proved to be nil. Engine failures with these power plants were common occurrences, and some machines finished the course after a number of forced landings in fields and pastures ca. m. The light plane events did, however, bring out some very striking novelties in design, especially an exceedingly awkward-looking monoplane designed by Ivan Duggs for the Johnson Flying Service and equipped with a Vespene Hordson engine.

The 1935 air races, held at Mitchell Field, L. I., N. Y. in October, were successful for a number of reasons. Chief among them, perhaps, was the entry of two French Army planes in the race for the Liberty Engine Builders' Trophy, giving the race an international aspect for the first time; the apparent substitution of the various events; the use of observation type of piston displacement in grading the power of engines; the demonstration of the possibilities of light planes when powered with suitable engines, and the segregation of the military and civilian events, so that they did not interfere in the same events.

But even when the separation of the military and the civilian pilots, the Army and Navy planes were still the center of attraction so far as the spectators were concerned. In addition to 30 major events and the "On-to-New York" Race, there was a sham battle between National Guard planes and Army tanks, a balloon-bombing contest, an aerial circus, a sham air battle, parachute jumps, smoke screen laying, sky writing, bombing test and radio broadcasting from the air. The National Air Races continued to wear the colors of a military pageant. It is interesting to note, also, that there was a demonstration of wheeling a plane in the air. These were, however, a number of delayed opening parachute jumps, made in an attempt to break the ties existing record of 1,800 feet. In commenting upon the race in general, Aviators said that "the civilian planes made a brave showing in the background of military airplanes." Military control was strict, and there was much discussion both among operators and civilian competitors over the field rules and their enforcement. 1935, the last year before the taking effect of the Air Commerce Act, marked also the last holding of the National Air Races on a military field.

The On-to-New York Race for the New York Chapter of the N. A. A. Trophy was limited to civilian pilots, and the same means of choosing the winner was used in that as in the earlier events of this type, except that the rules for the pilot allowing a very long distance at moderate speed a better chance than in the previous year. The race was won by Kenneth W. Marnie, who flew his GN-5 powered "Monte Special," a laplane of his own construction, from Saint Monica, Calif., to Mitchell Field. The first event on the air port program



Enter in the "Monte Special" Trophy Race" of the 1935 National Air Races

proper was a two-for-all for the Glenn H. Curtiss Trophy, contested for by two-seaters with engines of 300 cc. piston displacement or less. Each plane was required to carry a load of 340 lb. The race, which was 20 laps around a 5-mi. closed course and was open to civilian only, was won by David L. Jones, who flew a Thomas-Morse 54E equipped with an Aeromarine 8 engine, averaging 122.9 m.p.h.

Mr. Jones with his record-breaking clipped wing Ordele won the second event and the trophy offered by the Merchants' Association of New York, when he straddled 20 laps around the 5-mi. course at an average speed of 134.2 m.p.h. Like the first event, this race was a two-for-all for civilian planes. The piston displacement limit was 800 cc. and the planes, which were all capable of carrying from two to four passengers, carried dead loads of 340 lb., supposed to be the equivalent in weight to two persons. The N. A. A. specifically requested that dead weight be carried by the wing planes instead of passengers.

The third event was the Liberty Engine Builders' Trophy Race, now known solely a military race. It was also limited to planes of the two-seater observation type, possessing top speeds of at least 80 m.p.h., and with more than 250 sq. ft. of wing area. The race was fifteen laps around a 12-mi. closed course. As has been said before, this event was featured by the entry of two French Army planes. Both Hotchkiss XLVs had powered with different engines were placed in the race. In fact, Capt. Henri Lescault, who pilot the 463 hp. Renault-engine Renault, was the winner, with an average speed of 129 m.p.h. His colleague, Capt. G. Pichler d'Orly, whose long-distance flights had made him the darling of the French public and whose plane was equipped with a Loewenstein 352 hp. engine, came in fourth.

THE RACE of the Aviation Country Club of Detroit Trophy was changed in 1935 to the Aviation Town and Country Club of Detroit Trophy, but the winner of the prize was chosen in the same manner as before. The event was for civilian planes only, with top speeds of at least 80 m.p.h. and with engines of not more than 800 cc. piston displacement. They were required to carry a pilot and two passengers, each weighing at least 125 lb., or a 340 lb. load. The race was 20 laps around a 5-mi. course, and the winner was adjudged on a basis of speed and also an efficiency determined by the product of speed and constant load carried per horsepower.

Mr. Jones, whose Ordele was still hotly holding together every corner at which it was entered, won the race by piloting the plane over the course at an average speed of 128.4 m.p.h.

It will be remembered that in 1925 the Government was preparing to let contracts to private operators for the carrying of air mail. As a result of this, the Detroit News Air Mail Trophy became the Detroit News Air Transport Trophy in the National Air Races held at Mitchell Field. Originally the race for the Air Mail Trophy was limited to multi-engine planes of large capacity. Then, for two years, its name became more inclusive as to what it was, when the rules were changed and it was accepted for only by air mail planes. With the change in name to the Air Transport Trophy, however, the regulations governing the race for this trophy were restored practically to their original form. In addition, the race was limited to military aircraft, the Army and Navy having adopted the policy of refusing to compete against civilians. The requirements for entry in this race were a total wing area of more than 600 sq. ft., and the ability to carry a load of 2,000 lb. The contest said that such plane was required to carry was proportional to total piston displacement starting with a basic figure of 1,600 hp. for a machine with two Liberty engines.

While the old Martin bombers were still represented in the contest, the government had by now obtained some more modern heavy bombing equipment and the race was won by Capt. E. E. Henson, U.S. A., who piloted a B-17C bomber with a single 800 hp. engine (no engines in the 1938 event) at an average speed of 119.91 m.p.h.

In spite of the poor showing made by the motorcycle engines light planes the year before, the races in 1935 included the two light plane events originated at Dayton. The first one, for the Dayton Daily News Trophy, was governed by essentially the same rules as before. The event was limited to planes with engines of not more than 80 cc. in piston displacement, while the pilot was required to weigh 125 lb. In the event that they weighed less than 150 lb., the plane was to carry sufficient ballast to make up for his deficiency. It consisted one strongly of a home-made race. The race, of course, was for civilian and was flown ten laps around a 5-mi. course with a check at an altitude of 500 ft., as one mile on each end of the course. The stipulation of the N. A. A. in regard to the planes entered in this race is interesting.

"General conditions and design of place to be such that, in the opinion of the contest committee, it is safe and not a source to other contestants," and the rules evolved by the N.A.A. "The contest committee may require a demonstration flight with racing maneuvers from any planes whose safety it considers questionable. The



B. D. Wright's "Shoeshoemaker" won the 1925 race.

contest committee reserves the right to refuse to admit any airplane which does not comply with these requirements."

All the entrants in the Dayton *Daily News* Trophy Race and the speed and efficiency race for light planes, which was for the Scripps-Howard Trophy in 1925, were powered with motorcycle engines except for the "Pawnee Race" built by Prof. C. H. Powell of the University of Detroit and a group of his students. This little machine was a real racing job with a high wing loading. It had a Bristol "Chamois" designed especially for airplane work as its power plant, and qualified as competition. Piloted by Percy V. Duck, it was both events. In the first race the plane maintained an average speed of 71.16 m.p.h., while in the second its speed was only a shade lower. The distance and course of the second race were the same as the first, but the winner was selected upon a basis of both speed and efficiency. Efficiency was determined by means of the formula

$$\text{Speed of completing race in mi./hr.} \\ \text{Gasoline consumed}$$

It has been an almost invariable rule that difficulties, delays and disputes have resulted whenever it has been necessary to measure fuel consumption to determine the winner of a competition.

The Mitchell Trophy was flown ten laps around a 32-rod course. As a result of the short course, the speed was disappointing. First, Lieut. T. K. Matthews, who piloted a Curtiss PW-8 powered with a D-12 engine, a plane of the same type that was after the year be-

fore, was the winner. However, his average speed was only 161.5 m.p.h. The Pulitzer race, the most exciting event, was four times around a 50 km. course with a very sharp turn at one of the pylons. The race was captured by the late Lt. Cyril Betts, flying a Curtiss Army biplane equipped with a Curtiss V1400 engine, at an average speed of 241.655 m.p.h., a new world's record. Of course, Lieut. Betts was piloting a plane developed for the Schneider Trophy Race. However, the speed was not gained in a dive, since the N.A.A. had ruled, after the collapse of Capt. Skeel's race in the air in 1908, that the competitors must approach the turn's stand in horizontal flight. The Pulitzer Trophy has never been contested for since 1935.

THE 1926 National Air Races were held at Philadelphia, Pa., in conjunction with the Sesqui-Centennial Exposition, a celebration of the 150th anniversary of the Declaration of Independence of the United States.

The meet was entirely under civilian supervision with Howard F. Wehrle in charge, and of the numerous events, fourteen were for civilian flyers only, four for military and naval pilots and one for the National Guard units. The entry list totaled almost 300, but the attendance was not what was expected. This was probably due to the fact that the Pulitzer Trophy Race was not on the program. Also, the local population was troubled with showers of all kinds at the end of the exposition season, and the weather was not particularly good. The field, a new one, became dreadfully soft and muddy, and transportation over the roads leading from the city was inadequate.

The "On to the Seaplane" race was won by Prof. D. Hoot, flying from Eureka, Calif., in Philadelphia, a distance of 2,538 mi., in 34 hr. flying time. Second place was won by Austin Lawrence and third place was won by Russ Arnold. Both flew C-135 powered Juniors from Long Beach, Calif., Tex. Gary Jones, with his flying-wing Curtiss engine powered, with a Curtiss C-3 engine, growing venerable but still in the ring, was the last-place holder. His trophy, a free-for-all race for two, three, or four-place commercial planes over a distance of 800 mi. Jones' speed was 136.11 m.p.h. and it was his third consecutive victory in this event. The fact that a new class assembly of 1921 design could still be winning victories in 1926 indicated either a depressing lack of progress in design or something strikingly defective in the racing rules intended to encourage commercial planes. James G. Ray took second place in a Pileston Seaplane-Wing Army control with a Curtiss C-3 engine at a speed of 127.89 m.p.h. A National Guard man brought together eleven JN machines of the New York, New York, and Maryland National Guard units. The Guard was still faithful to the "Jenny" in 1926, but the end of its service was near at hand. The event was won by Carl W. Rish of New York at a speed of 99.08 m.p.h.

The race for the Aviation Town and Country Club of Detroit Trophy was won by J. G. Ray in his Pileston Seaplane-Wing at a speed of 136.37 m.p.h., accomplishing the almost unprecedented feat of negotiating Mr. Jones and his Oracle to second place, though by a very small margin.

The efficiency race, the new one, developed interest in the economy formula involving speed and load, were won by Lieut. C. C. Charnson, U.S.N., heir holder of all the altitude records, flying the new Wright Beltsman powered with a Whirlwind engine. The Wright Beltsman was the premier among the modern group of

small single-engine monoplanes with the pilot seated inside the same cabin with the passengers.

After two preliminary heats were flown for the Aero Club of Pennsylvania trophy for light commercial planes, the final was won by R. S. Hewitt in a Waco, at a speed of 157.53 m.p.h. Russ Brown, flying a somewhat antiquated Thomas-Morse with an Anzani engine, took second place. Capt. Im. Eider of the Air Corps, flew his Curtiss O-1 Falcon, powered with a Curtiss D-12 450 hp. engine, to victory in the Liberty Engine Builders' Trophy contest at a speed of 142.26 m.p.h.

The second military event was a transport and bombing plane contest in which Huff-Daland L-3-L-1 planes powered with Packard 300 hp. engines competed against Douglas C-1 transports powered with Liberty engines. The Huff-Daland finished one, two, and three, and Lieutenant Wolfe crossed the line first at a speed of 123.71 m.p.h.

The John L. Macfadyen race for planes of the First Pursuit Group of the Air Corps was won by Lieut. L. G. Elliott at a speed of 160.4 m.p.h. Capt. F. A. Pohlman was second with a speed of 160.1 m.p.h. All of the race planes competing were Curtiss P-1 Hawks powered with Curtiss D-12 engines.

The comparison of these three military events with the corresponding ones at Detroit in 1922 is interesting. The speed of the observation planes had been stepped up to 13 m.p.h., that of the bombers by 10, that of the pursuit ships (since 1933) by 14. The progress in performance, judged by itself, was satisfactory. More attention had been concentrated upon improving the strength, load-carrying capacity, equipment installation, and general versatility of military planes.

The event taking the place of the Pulitzer Trophy



Left: Army after crossing the line at Rochester 1915. Above: Army flying wing by Rochester.

was the Kansas City Rotary Club trophy race, open for pursuit and fighting classes of the Army, Navy, and Marine Corps. The Navy was victorious in this event when Lieut. G. T. Coddery flew his Boeing PB-3 plane, powered with a 600 hp. Packard 2A-1800 engine, across the line in front of the eleven other competitors at a speed of 180.7 m.p.h. Lieut. L. G. Elliott of the Air Corps was second and he brought a Curtiss Hawk P-3, powered with a 500 hp. high-compression Curtiss V-1400 engine, through at an average speed of 178.6 m.p.h.

The final event on the program was a transport race for the Detroit *News* trophy, open to commercial planes capable of carrying a useful load of 1,000 lb. Speed

and efficiency were the deciding factors of the race. Lieut. Champagne again flew his Wright Beltsman, powered with a Whirlwind engine, and won both parts of the contest with a maximum speed of 121.5 m.p.h.

In connection with the air races at Philadelphia there was also an associated exhibit under the aegis of the Aeronautical Chamber of Commerce of America held in the Transportation Building, the first attempt to combine an exhibition on a large scale with the National Beers. In addition to the latest types of aircraft engines and aircraft and engine equipment, the Curtiss NC-4, the first plane to cross the Atlantic Coast, was on exhibition.

IN 1927 the National Air Races were held at Falls Field, Spokane, Wash., during the week of September 19 to 25. The arrangements were handled by the Air Derby Association of Spokane, working in conjunction with the National Aeronautic Association. Maj. John T. Fowler of the 41st Dragoon Air Service, Washington National Guard, was the senior executive. Probably for the first time, the meet came near inside



Left: Army after crossing the line at Rochester 1915. Above: Army flying wing by Rochester.

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Bellhop, in another Laird, whose time was 20 hr 18 min and 10 sec. N. B. Mawer was third place in a third Laird. Fifteen planes started the race and seven finished in Spokane.

The Class B derby was won by Charles W. Meyers, who flew a Whorl 10 across the country with numerous stops en route in a total flying time of 39 hr 28 min and 15 sec. No time was taken out in any main air stops between controls. Leslie Miller was second place in Class B in 20 hr 47 min 13 sec, flying an Eaglehawk, and third place was taken by J. F. Charles. Of the twenty-five planes that took off from Roseville Field, L. 1, in Class B, also completed the cross-country course. A non-stop race from New York to Spokane, in which there were three entries, failed to become a non-stop race as all three were forced down before they had reached their destination.

In addition to the cross-country races, there were San Francisco-Spokane Derbies, Class A and Class B. The Class A race was won by M. C. Lyman, who flew a Travel Air plane from San Francisco to Spokane with one stop en route in a total time of 16 hr 10 min, 37 sec. Los Angeles was second place with an International biplane. The Class B race was won by C. G. L. Langdon, who flew his International biplane over the course in 9 hr 59 min, 28 sec. Second place was won by D. C. Warren in a Travel Air biplane.

The planning of the Air Derby, and the enormous popular interest that they occasioned, were symbolic of the place that air transport had taken in the decade, promoting the Spokane meeting. The demand was far greater bearing upon the ability of the airplane to fly directly from place to place, and go in a hurry.

The races at the field opened with a four-far-all for commercial planes around a two lap course for 80 mi. James Jay Bying a Potters Scout-wing won with an average speed of 136.145 m.p.h., two-fifths of a mile less than he had made with the same type at Philadelphia in the preceding year.

THE MARIAN EAGLE trophy was the Western Flying Trophy race, open to planes powered with an OX-5 engine and carrying six passengers. Eugene DeSoto flew his Travel Air Eaglehawk to a victory with a speed of 102.555 m.p.h. An Eaglehawk and a Whorl both came within five mi. p.h. of the winner. Both pilots carried a total load of 340 lb. The *Delta Dwyer* and the *Daytone Dwyer* never left airplane trophy races but only one entry, the *Heath Potters*.

The Liberty Eagle Builders trophy race was won by a Curtiss Falcon X-14A, powered with the new Curtiss V-1550 engine. L. W. Harry A. Johnson flew this two place plane over the 200 mi. course at an average speed of 170.136 m.p.h. Second place went to another Falcon piloted by Louis George A. McFerry whose time was 55:09.00 m.p.h. Third place was won by Ernest W. R. Taylor, flying a Douglas OBC at a speed of 129.355 m.p.h. Louis Johnson's winning plane was a standard Curtiss Falcon of that date except for the substitution of wing radiators instead of the fuselage type.

In the free for all military pursuit ship race for the Spokane Spokesman's Express trophy, Ernest Eugene C. Swann of the Army Air Corps piloted his Curtiss XP-6A (Curtis Hawk), powered with a Curtiss V-1550 engine and equipped with wing radiators to first place at the speed of 231.235 m.p.h. The only other race close

to Batson was Ernest A. J. Lynn, also of the Air Corps, in a Curtiss Hawk with a turret radiator under the nose of the plane. His speed was 189.608 m.p.h. Two Navy planes finished third and fourth. They were both Boeing Fighters powered with Packard engines. The really phenomenal amount of speed over previous years, both for observations and for pursuit planes, represented



A Curtiss Potters of the 1928 National Air Derby.

a new direction by the command of the Army Air Corps to see what could be done if some of the "practical" limitations on the design of military planes were abandoned and the lessons learned with racing machines applied directly.

The Packard Motor Car trophy race for large capacity military planes was won by a Fokker tri-engine transport piloted by Ernest W. Batson. His race was 118.158 m.p.h. and his plane was powered with three Wright Whirlwinds.

In addition to the racing events there were various stunting exhibitions and parachute-jumping contests. One event that brought the crowd to its feet was a nine-man jump from a single Douglas transport within 18 seconds, the first public display of that feat.

ANOTHER mention with regard to the 1928 National Air Race was that the monoplane type of construction which had been so much in the firm in the commercial market in 1927 was very little apparent at the races. Of all the planes in the field, which numbered a great many, only nine were of the monoplane type.

In 1928 the National Air Races were held in conjunction with the Los Angeles Aeronautical Exposition at Los Angeles, Calif., and they went down in history as the most successful aerial contests from the standpoint of financial revenue and attendance, ever held in the United States. During the raw days of the month there were over 80,000 paid admissions and at least in many cases persons attended the flying from outside the grounds.

That year there were six cross country air derbies,

Class A, B and C from New York to Los Angeles, Class A and B from San Francisco to Los Angeles, and an international race from Whorl to Los Angeles. In addition there was a non-stop race from New York to Los Angeles, but like the 1927 race the non-stop never all stopped at the wrong place.

The winner of the Class A derby for the twenty-second machine from New York to Los Angeles was Earl Rowland, who flew his Warner-powered Cossau monoplane over the course in the total flying time of 24 hr 31 sec. Second place was won by Robert Dabo, who piloted his Warner-powered American Mach over the course in a total time of 25 hr and 18 min. 43 sec. Third place was won by W. H. Evers, who flew a Travel Air, also powered with a Warner. The Warner engine made a clean sweep. The OX-5 had disappeared at last.

Class B was won by John Livingston in a Warner-powered Waco, in the time of 22 hr 26 min, 59 sec. From New York to Los Angeles. Second place winner was E. E. Ballough in a Whorl-powered Laird in a total flying time of 23 hr 15 min, 34 sec. Third place was won by J. P. Wood, who flew a Whorl-powered Waco.

The Class C race from New York to Los Angeles was won by Robert Campbell in a Lockheed with a Pratt & Whitney Wasp. Second place was won by the late Capt. C. D. B. Colyer, who flew a Fairchild monoplane. In fact it was the same plane, "The Gray of New York," in which he established a round the world record in 1926.

The Class A derby from San Francisco to Los Angeles was won by E. H. Myrland, who flew a Kassar powered Simplex over the Pacific Coast course in 8 hr 10 min, 26 sec. The Class B Oakland to Los Angeles race was won by S. C. Lippert, flying a Whorl-powered Travel Air in 2 hr 26 min, 49 sec.

Although the 1928 National Air Races were primarily intended to be a civilian affair, the military, civil and marine corps pilots held the center of the stage throughout the entire nine days of flying to such an extent that the audience often did not know when a civilian race was going on. Of the three branches of aerial defense the Navy was the most continuously spectacular. For the first time the National Air Races were being held near a center of naval air activity, and the Battle Fleet's Aircraft Squadron had a chance to show what they could do. In fact it was "Sea Hawk" composed of Lieut. W. V. Davis, Jr., Lieut. F. Tinsman and Lieut. A. P. Stern put on spectacular formation flying displays at the most suitable order. Alternating with the Navy team was the Army group composed of the "Three Hies



The "Three Hies" crew: Lieut. J. A. Woodring, Lieut. J. J. Williams, and Lieut. J. A. Woodring.

leaders." This original group was made up of Lieut. W. L. Gendron, Lieut. J. A. Woodring, and Lieut. J. J. Williams. Due to an unfortunate crash which resulted in the death of Lieut. J. J. Williams, Colonel Charles A. Lindbergh became one of the Three Hies. In addition to the spectacular flying of these groups, there were some beautiful flying performed by Army, Navy and Marine Corps bombing and attack squadrons.

THE FIRST RACING EVENT was a closed course two-lap race for Marine pilots flying Vought "Curtains" and was won by Lieutenant Colburn at a speed of 129.12 m.p.h. At this point the Class A California race plane came in, a bit slower than expected. The next racing event was for pilots of the First Pursuit Group for the John L. Mitchell Trophy and was won by Lieut. E. H. Linnell at 134.743 m.p.h., a lower figure than had been required for victory in the more recent at Spokane. The race was twelve laps over a 10 mi. course for the John L. Mitchell Trophy, and the planes were Curtiss P-1A & B pursuit planes powered with the Curtiss D-12 engine. It is interesting to note that the winner's speed was a little over four miles per hour slower than the time of the following year's winner, a Curtiss P-4 flown by Lieutenant Woodring over the course at 138.90 m.p.h.

The third military race on the program was a twelve lap closed-course event over a 10 mi. course for pilots of the Third Attack Group and the plane used was the Army attack type powered with Curtiss D-12 engine. This was the first annual race for the Mason M. Patrick

Start of the Class A race from New York to Los Angeles. Earl Rowland leads.



Trophy, presented by Assistant Secretary of War Douglas MacArthur, and it was won by Lieut. G. R. Johnson at a speed of 189.9 mph. Second place was won by Lieut. R. W. Anderson at 136 mph, and third place by Lieut. E. C. Robinson at a speed of 138.06 mph.

The fourth event was also a military affair, being a race for the Liberty Engine Builders' Trophy and won by Lieutenant Kane at an average speed of 142.5 mph. Lieutenant Pick won second place and Lieutenant Ellis was third. All of the entries were Navy "Curtis" powered with Wasp engines, the Army entries being J-47s.

It will be remembered that a Curtiss Hawk fitted with a Curtiss V1550 engine was this race at Spokane at an average speed of 170.136 mph. However, the water-cooled machine was not a standard Falcon, as it was fitted with wing radiators.

Two came the first civilian class, a tie-up affair over a 5-mi. closed-course and open to civilian planes equipped with engines under 510 cu. in. displacement. Four boats were flown and the winners of each heat flew in the final, which was won by Earl Donaldson, flying the Warner-Weaver Corsica, with which he won the Class 5 New York to Los Angeles Derby. His average speed was approximately 111.74 mph. Second and third places also went to Warner engines while all the other entries were OA-5-powered.

The second civilian event was a free-for-all for speed-class planes powered with engines of 800 cu. in. displacement or less. E. B. Bellogg, flying a Whitworth-powered L-6B biplane, flew away with the race at an average of 132.9 mph.

In a Navy pursuit race over a 20-mi. tie-up course, Lieut. John O. Cunningham won, flying a Boeing 22B over the course at an average speed of 148 mph.

Then came a 20-mi. tie-up light airplane speed and efficiency affair which was won by E. B. Heath in his own Mustang monoplane "Baby Birdie" powered with a "Reed" "Cerberus" engine. Heath's speed was 111.7 mph. Van Roberts in a Mooney powered with a Volt engine was second at an average speed of 97 mph. Heath's plane, with its 45 hp. wing span, scored great movement in the crowd. It was extremely fast, but was a pure novice with a very poor landing, intended for no other service. It represented a great departure from the spirit in which light plane construction and competition had first been undertaken.

FOLLOWING the light plane race came a 50-mi. tie-up race for two-place National Guard planes. This event was won by Lieutenant Runkle in a Douglas C-47, powered with a Liberty, in 28 min. 1 sec. at an average speed of 125 mph. The J-47s were in last place from the National Guard as elsewhere.

In a closed event for the 19th Pursuit Squadron, all entries were Curtiss Hawk powered with Curtiss D-12 engines. First place honors went to Lieutenant Currier who flew the course at 148 mph. Corbett took the lead at the start of this race and continued to increase its right to the finish line. An air blunder across the line by a newly enlisted with Lieutenant Wilbur who was held a lap to go. Only quick maneuvering on the part of each avoided an accident.

Then came a parachute jumping contest in which 16 jumpers stepped off at an altitude of 3,800 ft. and attempted to land within a 200 ft. circle marked out on the field. Sgt. George W. Whiting of March Field, California, won the event by landing 34 ft. 7 in. from

the center of the circle. George H. Beak of the San Jose, Calif., Air Station was second with a distance of 96 ft. Whiting and Beak were the only two jumpers to hit the circle.

Then came a 300-mi. 10-lap civilian free-for-all for any type of solo plane powered with any, two or three engines and carrying a contest load of 1,000 lb. Robert Corbett, winner of the Class C transcontinental air derby, flying a Wasp-powered Lockheed Vega, won first place with an average speed of 340.3 mph. Arthur Goffert was second, also in a Wasp-powered Vega, at an average of 189.7 mph.

THE PHYSICAL and many local records for attendance, a total of over 50,000 persons visiting the occasion and the race at Mines Field. As had been the case throughout the entire week of activity, the Army and Navy plants again held the center of the stage and put on a few exhibitions of formation and stunt flying. The first free-ee event on the day's program was a 60-mi. 6-lap race-around military pursuit race open to military planes only. This race was won by Lieut. J. P. Jones, flying a Boeing N24B powered plane with a super-charged Wasp engine. Lieutenant Johnson's average speed was 172.36 mph. Second place honors went to Lieut. Edgar A. Cruise who flew the course at 159.8 mph.

The next event on the program was a 25-mi. five-lap race for National Guard, Army and Navy biplane pilots flying "P" training planes. Then followed a special Army race for Liberty-powered Douglas planes from Crissy Field.

The closing entries of 1958 National Air Races were a "blind race" landing contest, and a driving and driving race to 10,000 ft. and return. The dead heat contest was won by P. French in an Aeromarine Klaxon, who came to rest 4 ft. from the finish line. An Eaglet took second place and a Travel Air third. This type of event is rare, testing the pilot rather than the plane, was very unusual. It had been omitted completely after years from the program for safety reasons. The challenge and driving event, Lieut. T. P. Jeter won first place in his supercharged-Wasp Lockheed N24B by making the trip up to 10,000 ft. in four minutes and returning to the ground speed at 1,000 mph. A Curtiss Hawk powered with a Curtiss D12 engine and flown by Lieutenant Seligman was second with a total of 7 min. 3 sec.

Although the 1958 National Air Races failed to show any spectacular performances from the military machines, the speeds of the various commercial planes revealed were much higher than those shown in previous contests and the all-around dependability of the new planes and engines was well demonstrated. The Aero-nautical Exposition itself, although secondary in importance and attractiveness to the public, will have laid out and improving, especially in spectators service, on paper in seasonal work has drawn out by the excitement of the race. Two hundred and fifteen airplane manufacturers, distributors, makers of accessories, aviation clubs, Chambers of Commerce, etc., occupied booths in the big pavilion at Mines Field. The number of people on exhibition totaled 38. Novel and radical ideas were commonplace for their show.

The Cleveland story will have to go far to equal the interest of the events at Los Angeles. However, according to laudatory information, the Cleveland races will be fully up to the standard set last year and that the Aero-nautical Exposition will be one of the greatest of its kind in the history of the industry.

National Air Race Program

SATURDAY, AUG. 24
2:00 p.m.—Inspected parade
2:30 p.m.—Parade planes
2:45 p.m.—Main flight

MONDAY, AUG. 25

10:00 a.m.—Tandem glider flight
1:00 p.m.—Start of All Ohio Derby
1:00 p.m.—Event No. 6, 30 mi., civilian, GL-3
2:00 p.m.—Arrival of Navy planes
2:30 p.m.—Arrival of Army planes
2:50 p.m.—Event No. 25, 120 mi. Liberty-powered Douglas (Navy) planes
5:00 p.m.—Event No. 20, 120 mi. multi-engine planes carrying 1,000 lb. payload

TUESDAY, AUG. 26

10:00 a.m.—Tandem glider flight
From 1:00 p.m.—Arrival of Western Air Derby from Santa Monica, Calif.
Event No. 4, 100 mi., Marine Squadron
Event No. 6, 120 mi., Army attack group

Arrival of All Ohio Derby
Event No. 14, 320 mi., military two-place Liberty engine planes

WEDNESDAY, AUG. 27

10:00 p.m.—Demonstration of commercial aircraft
11:00 a.m.—Glider contests
From 1:00 p.m.—Arrival of Mustangs
Main Race Derby
Arrival of Fordford, Gen. Derby
Event No. 1, 30 mi., women, 310 cu. in. displacement
Event No. 2, 100 mi., civilian, 300 cu. in. displacement
Event No. 15, 30 mi., civilian, 375 cu. in. displacement, open class

THURSDAY, AUG. 28

12:00 a.m.—Glider flights
From 1:00 p.m.—Arrival of Oakland, Calif., Derby
Arrival of Philadelphia Derby
Arrival of Los Angeles Derby
Event No. 5, 30 mi., civilian, 275 cu. in. displacement
Event No. 26, 60 mi., women, 510-800 cu. in. displacement

FRIDAY, AUG. 29

10:00 a.m.—Greater Cleveland model airplane contest
From 1:00 p.m.—Arrival of Canadian Derby
Event No. 12, 60 mi., civilian, rapid, four CX-3 planes per team
Event No. 13, 30 mi., civilian, 750 cu. in. displacement
Event No. 28, Dead slide landing contest for women

FRIDAY, AUG. 29

From 1:00 p.m.—Event No. 27, 75 mi., civilian, 600 cu. in. displacement, open category
Event No. 21, 130 mi., Navy pursuit

Event No. 30, 60 mi., women, 275-800 cu. in., Australian pursuit race

SATURDAY, AUG. 31

From 1:00 p.m.—Event No. 7, 120 mi., Army pursuit
Event No. 32, 75 mi., Australian pursuit race, open class
Event No. 29, Dead slide landing contest for women
Event No. 30, 75 mi., civilian, over 800 cu. in. engine planes, per load
10:45 p.m.—Kilom Derby to Milan, Ohio, start race

SUNDAY, SEPT. 1

From 1:00 p.m.—Event No. 35, 100 mi., civilian, multi-engine planes carrying 1,000 lb. payload
Event No. 31, 75 mi., 500 cu. in. displacement, cabin planes with payload, Aviation, Tobin & Company Derby
Event No. 31, 75 mi., 275-500 cu. in. displacement, Australian pursuit race
Event No. 32, 75 mi., Australian pursuit race

SUNDAY, SEPT. 2

From 1:00 p.m.—Event No. 28, Dead slide landing contest for women
Event No. 3, 30 mi., civilian, semi-annual placement plane
Event No. 29, 20 mi., open class
Event No. 30, Closed to Buffalo's efficiency race
Event No. 31, Closing of trophies and prize money
3:30 p.m.—Banking ceremony at airport

EVERY DAY

Army and Navy maneuvers
Exhibition glider flights
Parachute jumping contest
Dead slide landing contest
Kilom-bering contest
Aerial acrobatics with fireworks

Aero-nautical Exposition and Conference Program

SATURDAY, AUG. 24

2:00 p.m.—Exposition opens
3:00 p.m.—Inaugural ceremony

SUNDAY, AUG. 25

9:00 a.m.—1:00 p.m.—Aero-nautical Chapter of Consulting Contractors Commercial Airplane Manufacturers' Institute, Airplane and Material Manufacturers' section
10:00 a.m.—Joint Conference of Fuel and Lubricants Committee with Aircraft Engine Manufacturers' section
10:00 a.m.—Standards Section, Society of Automotive Engineers' section
Aero-nautical Chapter of Consulting Contractors
2:00 p.m.—Propeller Section S.A.E. and A.C. of C.

3:30 p.m.—Power plant Section, S.A.E. and A.C. of C.

WEDNESDAY, AUG. 27

8:30 a.m.—National Glider Association, brochure and conference
9:00 a.m.—1:00 p.m.—A.C. of C. Commercial Airplane Manufacturers' Institute, Distribution and Delivery section
10:00 a.m.—Joint conference of Fuel and Lubricants Committee with Air Transport Association
10:00 a.m.—Airplane Design Section S.A.E. and A.C. of C.
10:00 a.m.—S.A.E. and A.C. of C. Insensitive Pilot to Gusty Airplane Ziegler, Akron
3:00 p.m.—Automotive engineer and Section S.A.E. and A.C. of C.

THURSDAY, AUG. 28

9:00 a.m.—1:00 p.m.—Society conference, A.C. of C. Commercial Airplane Manufacturers' Institute, Fuel and Lubricants section
10:00 a.m.—S.A.E. and A.C. of C. Light-Airplane Section

FRIDAY, AUG. 29

9:00 a.m.—1:00 p.m.—A.C. of C. Flying School conference meeting, Research-Increase section
9:00 a.m.—1:00 p.m.—National Aero-nautical Association Conference
10:00 a.m.—2:00 p.m.—S.A.A. convention

SATURDAY, AUG. 31

9:00 a.m.—1:00 p.m.—S.A.A. convention
9:30 a.m.—Air Mail Eng. Souvenir Section

SUNDAY, SEPT. 2

10:00 a.m.—Joint conference of Departments of Commerce with Commercial Airplane Manufacturers' section, A.C. of C.

START DAY

9:00 a.m.—1:00 p.m.—Registration room for pilots and members of Aero-nautical
10:00 a.m.—10:45 p.m.—Exposition opens
11:45 p.m.—Pyrotechnic display
1:00 p.m.—Aero-nautical Exposition

Aero-nautical Chapter of Consulting Contractors will be held at Hotel Hudson.

Joint sessions of Society of Automotive Engineers and Aero-nautical Chapter of Consulting will be held at Hotel Hudson.

National Aero-nautical Association convention will be held at Hotel Cleveland.

THE *Military Value* OF AIRPLANE RACING

By LIEUT. COMDR. FRANK W. WEAD
U.S.N. (wv)

HIGH SPEED RACING in the past has given great impetus to airplane and engine design, and has spurred the development of many positions that are directly and beneficially reflected in nearly every airplane in use in the United States today. It is only natural that these improvements were first applied to the pursuit and fighting planes of the Army and Navy, for such service as they are, of course, single seaters of high performance and more readily able to racing types than any other class of airplanes. Following this trend practically every single-engine airplane now in commercial or service use has borrowed something—and that something very vary from general arrangement to a minor detail—from fighting plane design.

For several years after the World War fighting planes in the United States were of such low performance that in reality they were little more than single seaters racing

planes. In 1920, 1921, 1922 and 1923 a few high speed racing planes were built for the Army and Navy to compete against each other in the Pulitzer Cup Race. Two of these planes were later converted into seaplanes and in 1925 was first and second place in the Schneider Cup at Compt against England and France. At this time foreign racing seaplanes were at really "pegged up" at outmoded service standards. It was the American victory that gave foreign aeronautical engineers their first glimpse of racing airplanes designed primarily for speed and spurred the development of similar types in England and Italy.

The top speed obtained by any of these American racing planes prior to 1924 was about 260 m.p.h. in straight flight as a seaplane. (It may be noted here that "course speeds" are noticeably lower than speeds in straight flight, and that the added resistance of floats, of course,



The U. S. Schneider Cup team in 1924. Lieutenant Wead, second, left to right; Lieutenant Wood, third; Robinson, fourth; Wilson, fifth; and, last, right, Wead.



The Vickers Vimy seaplane which beat Alfred Williams' attempt to fly to Canada, England, in September.

Comdr. Wead writes from experience. He was a member of the Navy's Schneider Cup team both in 1923, when the trophy was won from the British, and in 1924. Having known racing at first hand, he has also been a close student of the purely military aspects of aviation, and has made notable contributions in air tactics and naval air material to the United States Naval Institute and other professional journals. His analysis of the extent of the parallel between racing and fighting development he reads with interest by all students of design.

reduced the seaplane speed of a type below its landplane speed.) This speed of 260 m.p.h. was attained by gradual refinements of the same type of racing plane and power plant. In 1925, 1925, and 1926 an additional small increase in speed was obtained through further refinements, but the indication clearly was that the limit had about been reached in this American water-cooled engine racing type, and that a radical increase in landing speed (Pulitzer rules required a theoretical landing speed of not more than 55 m.p.h.) or a new and superior power plant was necessary to gain a marked increase in m.p.h. In 1925 the Army and Navy both abandoned the Pulitzer Race, and since Italy's victory at Norfolk in 1920 the United States has not been represented in the Schneider Cup. The design and preparation of several racing planes each year costs a considerable sum of money,

and accuracy has been advanced as the reason for government abandonment of racing projects.

In 1924 and 1925 the experience gained in using in previous years began to make itself definitely felt in our fighting planes. Newly designed single seaters were better streamlined, fitted with metal propellers, spars, and trussing radiators; their power plants delivered more power at higher r.p.m. and stood up better under the higher power output, and they were designed to land considerably faster than previously considered advisable with a correspondingly greater high speed. Wing radiators, invariably found in racing planes, have never been fitted to service types because of their susceptibility to cold at extreme altitudes and their vulnerability to machine-gun fire. It was soon discovered that the average service pilot could handle these fast landing types without difficulty in fields or on the docks of aircraft carriers. It is necessary that fighting planes carry machine guns and other equipment, that the wing curve could be selected for other considerations than pure speed, and that they afford the pilot better visibility in combat and have a rounder fuselage than racing planes. Notwithstanding such differences these new fighting types distinctly had their origin in our early high speed races.

Just as our racing planes made no radical advances during the five or six years that the United States was actively engaged in high speed contests, neither have our present types of fighting planes improved to any great degree since their inception. It may be noted, however, that from 1921 to 1925 the United States, generally speaking, led the world in speed, and that competition was international rather than international, and hence incentive for national staps did not exist. From 1924 to 1928 our fighting planes were also quite superior in performance to similar foreign types, primarily because foreign engineers did not until recently have the benefit of several years of high speed racing experience behind them. Since 1927 our fighting

planes have been built almost entirely around air-cooled radials, giving a better climb than that of water-cooled planes with little if any loss in top speed. These planes handle well and perform nicely, and far that reason perhaps we have been prone to be a little too content with them. In general, recent fighting planes are not markedly superior to those of four or five years ago.

In 1925 England sent its first two high speed airplanes into the Schneider Cup at Balbrunn. They were worthy competitors but accidents spoiled their chances for victory and the winner turned up in Lt. Jimmy Doolittle of the Air Corps. In 1926 Italy won the Schneider Cup at Norfolk. In 1927 England won at Venice with the astounding course speed of 281.5 m.p.h. This speed indicates a probable straightaway headline speed for the



Above: Curtiss biplane with which Raymond Kitchener won the Schneider Cup Race in 1925. Below: The Supermarine-Napier 24, built by Philip Lind & S. W. Watson, R.A.F., Schneider Cup winner in 1930.



same type of around 315 m.p.h. This truly remarkable speed was gained through perfect engineering, boosting the power output of the Napier Lion to around 900; obtaining the best propeller efficiency by using gears; keeping the fuselage as small as possible, and accepting a landing speed of some one hundred and twenty miles per hour.

Now, ever since the war British fighting planes have been light, handy and decidedly superior to climb. British pilots and engineers apparently never forget the deadly lesson war taught them in combat: it is usually the man on top who adds another victory to his score. The Bristol Jupiter radial was giving satisfactory service as a power plant in Fokker "Fighting" and other ships of the Royal Air Force long before we had an air-cooled engine worthy of mention. Combined with their experience in designing around air-cooled engines British engineers now lead the world as designers for speed. It is not to be wondered that recent British single seater fighters have an overall appearance that when placed beside our latest ships of the same type makes the latter appear, to say the least, somewhat clumsy. The performance of these recent British fighters does not belie their appearance.

In high speed racing the faster ship usually comes home in front. In war fighting planes form the backbone of a nation's air strength, and that side which is equipped with fighters even slightly inferior in performance, though it may be superior in numbers, is working under a tremendous handicap. In combat or dog-fighting between pilots of equal skill the superior airplane is certainly wins out.

There is an other form of competition or test that can supplant or take the place of high speed racing, where



Curtiss biplane with Packard engine entered in the 1925 Schneider Cup Race.

aerodynamics and engine design must combine to strive for, not a half-way work but the supreme. If we grant that the experimental laboratory of high speed racing has in the past meant something to our fighting plane program, can we possibly question its today when our fighters are powered with air-cooled radials and the record-breaking record of England and Italy are still built around the more costly air-cooled water-cooled engines. In 1927, however, one of the English entries in the Schneider Cup was a Short monoplane, powered with a special Bristol Blenheim air-cooled radial delivering some 800 hp. This plane unfortunately crashed to a wreck a few days before the speed contest at Venice. It goes without the Leader of the British High Speed Flight stated that he favored this ship as win, and the indication is that it was at least equal in speed to the Supermarine-Napier and Gloster-Napier that finished first and second. The Short machine had each cylinder head surrounded with an individual cooling system to a length's exhaust. Fitted with leaves for cooling. Perhaps some modification of the M.A.C.A. cooling would be even more effective. It is probable that were such a cooling adopted to service fighting planes, cooling troubles might arise in prolonged combat at full power, but it is certain that if this should prove to be true those troubles can also, with experience, be overcome.

The contention is that such an air-cooled racing plane, being lighter in weight and probably somewhat lower-powered than a similar water-cooled machine, can be fitted with smaller wings and have the same landing speed as its heavier water-cooled sister plane, and that the decrease in drag thus obtained may more than offset the greater resistance of the radial type engine. It would seem

that a government program to produce two air-cooled high speed racing planes each year for a period of three years to enter in the Schneider Cup and to strive to better existing headlines and complete speed records would be a very desirable worth while regardless of its cost.

The personal aspects of high speed racing are also worthy of mention. Service test pilots and racing pilots almost invariably come from fighting plane units, where single seater operations create competition among them as individuals rather than as crews. The effort to stand out in service and develop superior skill as a pilot improves the quality of our fighting work and may be definitely furthered by the knowledge that selection as a member of a racing team may be a possible reward.

It is contended it may be stated that the United States abandoned high speed racing at a time when freely unenclosed international competition would have made the lessons learned in victory or defeat of greatest value to us. We are now woefully behind in the design of high speed airplanes and the development of power plants for them, a state of affairs that is now being reflected in our fighting planes. The present splendid and spurring effort of Lieutenant Al Williams and his associates to place an entry in this year's Schneider Cup, backed by the highest possible technical support of Admiral Moffett and the Navy Bureau of Aeronautics, is worthy of high praise, but must come unsatisfactory to anyone who is familiar with the great number of problems and difficulties to be encountered in a task that so returns full value to the government should be wholeheartedly encouraged, financed, and just over by it.



THE VALUE OF

By C. S. JONES
President, Curtiss Flying Service, Inc.

SINCE the very early days, airplane racing has played an important part in airplane development. In fact, racing and the various prizes offered and the money set up have done more to develop aviation both technically and by increasing public interest than any other one thing since the war. With the outstanding flight of Colonel Lindbergh in mind, readers will question this statement, but it must not be forgotten that even that flight was made possible by a group of men and one determined boy out to win an important prize—that offered by Raymond Orteig. And so it has been with practically all of the great flights. Prizes stimulated aviation and created the interest of the world on aviation.

The purpose of this article, however, is not a discussion of contests or of setting after records, but rather of aerial airplane racing and its present value. The very early Belmont Park Meet did much to encourage aviation, who were for the most part their own manufacturers, and created tremendous public interest. The pre-war aviation for the Gordon-Bennett Trophy did much more to stimulate race and better designing and public interest, and led many cities throughout the world to hold various sorts of races.

There was no racing during the War. Soon afterwards came the important New York-Toronto Race in 1919. It was open to all types of airplanes and afforded lots of real interest to those of the general public who were slowly becoming air-minded. However, due to the difficulties of handicapping the various entries and to a serious misunderstanding concerning the distribution of the prize money, it could hardly be considered a great success.

The following year the Army conducted the Transcontinental Race which was won by the late Lieutenant Maynard—the Flying Panzer. It is interesting to contrast the flying time, 46 hr. 14 min., with the latest transcontinental record of 17 hr. 38 min. That race was well received by the newspapers, and was the forerunner of the transcontinental race now.

The National Air Races started in 1920 at Mitchell Field on Long Island. The individual event of greatest importance was for the Pulitzer Trophy, and for several years thereafter that event was the life of American airplane men. Lieutenant C. C. Massey, in the Verville race which had been back by the Army to compete in the Gordon-Bennett Trophy race in France the preceding year, attained a speed of around 160 m.p.h. It is interesting to note that, largely due to the

Mr. Charles S. Jones, more widely known as "Coney," has had extended experience in the racing both of stock and of non-stock airplanes. His is the unique record of having been among the winners at five National Air Races meets. His remarks on the unsatisfactory "stock-model" situation, contained in the latter part of his article, and on the desirability of an improved control over racing of stock planes are especially important in any plans for the future of air racing. They touch a point upon which organizations merchandising airplanes to the public naturally feel very strongly.

knowledge gained in constructing motors, the stockless Army plane first, by 1923, was later that the open-winged race which won the trophy in 1919. In 1921 at the National Air Races in Oshkosh, Bert Acosta won the Pulitzer after an exciting race with Clarence Coleman, in the Curtiss "Wildcat," also built originally for a Gordon-Bennett Race. The speed this time was 196.7 m.p.h., and although there were several other fast machines in this event these two were the only ones which really had a chance to win.

1922 was a banner year for speed racing. The Army gave contracts to a number of different manufacturers to build racing models for the events at Detroit, and as a result of their keen engineering competition, a speed of over 200 m.p.h. was attained for the first time. This was very particularly exciting for the spectators, who witnessed the greatest number of shut ships in racing competition that had ever been assembled for that purpose.

Airplane Racing AND THE Stock Model

St. Louis was the scene of the Pulitzer in 1923. Here the Navy fought to the front when Lieutenant Alford Williams won, with Lieutenant Harold Grew a close second. The speed was 243 m.p.h.

Knowned hundred twenty-four at Dayton showed an advance in speed, as the planes used were those developed in the previous years. The contest was further greatly marred by the death of Captain Skell.

In 1925, again at Mitchell Field, the highest speed ever attained in the Pulitzer Races developed in a hot contest between "Coy" Davis in an Army racer and "A" Williams in a smaller Navy machine—the pulse going to Davis in a close finish at 268 m.p.h.

Reviewing this development, then, up to 1925 it must be borne in mind, just while each year showed an increase in speed, it had become constantly more expensive

to obtain it. Several times had been lost and it had become questionable whether or not the accomplishing of high speed was worth the expense in money and men. Apparently, in the opinion of manufacturers, the important limit had been reached, and, consequently, as regards the National Air Races, from 1925 on the importance on sheer speed has decreased and the interest switched to a variety of races featuring efficiency as well as speed in stock models.

IN THE MEANTIME, however, strictly speed events have been carried on internationally in the competition for the Schneider Cup—the only event left which promotes tremendously high speed. According to the rules, any country which wins three times in a period of five years retains the trophy. In 1929 the cup was brought to



"Coney" Jones and the Curtiss racing plane "C-1" shown for the first time at the International Air Races at Dayton in 1934.

the United States by Lieutenant Rittsdorfer, who won it at Genes, England. In 1925 at Baltimore, Lieutenant Donald A. Smith won it for an hour and had the United States tried to hold the race the previous year, it undoubtedly could have retained the trophy permanently, but because of the lack of competition we had refused the opportunity. In 1926 the British wrested the cup from America in a thrilling contest in which England did not enter, and in the next race, in 1929, England turned the trick against Italy while the United States was absent, and secured the fastest speed ever attained in a closed-circuit race—283 m.p.h. The contest this year is to be staged in England between England and Italy, although it has been recently announced that Lieutenant Wilfong will represent the United States with a special machine constructed by private capital with the co-operation of the Navy.

Over a year ago, one of the leading American manufacturers was approached in the matter of building a racer to win the trophy in 1939 or 1940. After the most careful consideration and figuring they reported that this could possibly be done, but only at an expense of a million dollars and two years' time. The United States, after much debating, decided that the game was not worth the candle and dropped the matter. All that is really a matter of general history—the only thing to stress being that it would take at least two years and a great deal of money to produce a plane of sufficiently new and better design to beat the present speed record. [In 1936 the British did it in much less than two years, at an \$400,000 in Commander Searson's article, but only under concentrated national pressure and by very liberal expenditure of money—Ed.] Since there is grave doubt in the minds of those most interested whether the results warrant the expense, it seems quite evident that speed racing alone, has almost reached the limit of its successful development.

EXTENSIVE studies Lieutenant Wilfong very recently in the approaching contest, but it should be no secret the proposition of England and Italy it would be a valuable in modern racing history.

In introduction to this decline in racing for pure speed, there has been increasing interest and an increasing number of entries in the various events for commercial sale of different horsepower. Commercial races started in Omaha in 1931, and at first they too were very largely on pure speed. Very soon, however, it became apparent that the best purposes of commercial aviation could be served by competitors looking to records by stock models, or other of various lesser practical placements, with increased attention to efficiency as well as speed. Immediately certain injustices crept in and a great deal of hard feeling was caused, and still is, through various misunderstandings. What is worse, the public has undoubtedly been misled by the published results of the more widely so-called stock models. Much careful thought needs to be given this whole matter of commercial racing—particularly in the matter of rules and regulations governing contests. It is my opinion that should a race be advertised as "for stock models" it should be strictly limited to commercial flying, genuine stock models and not those that have been prepped up in various ways—whether by motor or fuselage changes or propeller settings. No attention whatsoever should be allowed, and any such changes should immediately disqualify the entrant. As recently as during the past two

years, numerous planes competing in, and sometimes winning, various events have been advertised by their respective producers in stock models, when in reality they so were assembled the stock model than a typical best done a cruel bait. Perhaps the only way to regulate it would be to mark the machine on the floor of the factory as it comes through on the line, then send the manufacturer over this in the race without any change whatsoever.

Raising under such regulations, either for speed or efficiency, would be a true test of comparative air performance, and the manufacturers most concerned would thus be justified in advertising their particular products and capturing on their successful efforts.

THAT is to say, a place for speed racing with various models having limited power displacement, and in these races anything to increase the speed or the efficiency should be permitted, but it should be made impossible, by strictest national regulations under such conditions, for the winning manufacturer to advertise the winning plane as such equipment.

The Ford Tour, and certain State Tours, are typical of another type of racing which will serve various purposes. But just as the old Golden Tour, having won for the automobile industry a certain public confidence in, and favorable predictions for, the motor car, passed on, so these events will also serve their usefulness and be remembered only in retrospect.

In this general avoidance of competition as a real end to the industry, there are still several advantages to be derived from the National Air Races. The publicity which attends the racing, particularly that which centers on the numerous cross-country events, fosters here interest in aviation during the racing period; the fact that the races are held at different places throughout the United States each year, gives a vast number of different people a chance to see a great number of airplanes at once and to view the races; the getting together of the pilots and enthusiasts and the interchange of ideas is always valuable; finally, if the Races are conducted on a businesslike basis, they should be financially helpful to the organization from which came them and thus, indirectly, of further benefit to the industry as a whole.

An airplane race is not, of itself, particularly exciting unless it can be run over a short course in view of its spectators, and here, if the speed is great or the course very short, the risk amounts up tremendously. It is, too, almost impossible to collect admission from anything like the number of people who are actually attracted by the sight—very neighboring billions in a crowded seat. With tremendously divided arrangements, perhaps at some future date it will be possible to handle the races in a way similar to the automobile classic at Indianapolis—a place especially designed for it where it can become a yearly feature. As a matter of fact, unless some such solution is worked out as a not too distant time, I can almost there will no longer be a need for the National Races as they are conducted today. Perhaps the future will see a pageant similar to the London Show sponsored by the Royal Air Force in England—a pageant more in the nature of a historical or handmade pageant, with formation flying, static air battles, bombardments, etc., furnishing the chief interest. Perhaps this sort of show, as the industry advances, may prove of even greater benefit in the future than our exceedingly worthwhile racing has proved in the past.

CHRONOLOGY AND TABULATION OF *Airplane AND Seaplane* Records



FIG. 1

test conducted by the National Aeronautics Association in Washington, D. C.

The curves, Figs. 1, 2, and 3, represented a chronology of world records for landplanes and seaplanes. Fig. 1 shows all chronology (except relaying) records in excess of one hour. The vertical scale employed was used to facilitate reading the earlier records. In Fig. 2 is shown the absolute records in excess of 1,000 ft. and in Fig. 3 are plotted the maximum speed records above 40 m.p.h.

A COMPLETE TABULATION of world and American heavier-than-air records is herewith presented. All of these with the exception of the most recent, have been homologated by the Fédération Aéronautique Internationale and all have been established under the rules and regulations of that body. For their translation and completion we are indebted to the au-

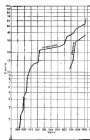


FIG. 2



FIG. 3

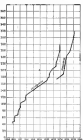


FIG. 4

Table 1: Class C Airplanes Returning to point of departure without refueling

[illegible]

Table 2: Class C2 Scenarios

[illegible]

Table 3: Light Plane Records

[illegible]Table 3: *Light Plane Records (Continued)*[illegible]

DEVELOPMENT OF HIGH SPEED Racing

By WILLIAM WAIT, JR.
Chief of Design Berliner-Joyce Aircraft Corp.

MAN'S CONSTANT BATTLE against time since the earliest ages has laid an interestingly large gamut on time-saving methods of transportation. This has caused a train of invention, arising from the primitive canoe on waterside through to the airplane of the present. A study of the various mechanisms used will fail to show any great variation from the basic principle through the life of any one device. The element of today does not differ fundamentally from Faho's. The railroad train is basically the same as Stephenson's. The automobile has the same essence as Selden's original, and the airplane is basically the same as the Wright brothers' primitive machine.

In all the devices that have been used through the centuries, the changes that have given us the highly efficient methods in use today have been due to attention to and perfection of detail. This same attention to the most minute detail will spell the difference between winning and losing in the close air competition that exist today. Perhaps the easiest way to emphasize this fact is to point out the progressive modification of the racing airplanes with which the writer is personally familiar.

In 1926 the Curtiss Company built a racing airplane, familiarly known as the Texas Wait Cat, to the order of Mr. S. E. J. Cox in an endeavor to win the Gordon-Bennett Cup Race held in France that year. This airplane was really the first ultra-high-speed airplane designed, the essential features of this plane being present in all of the successful planes designed since then. The fuselage was designed to be as small as possible and still properly house the motor and man. The wing structure was a rigidly braced monoplane type built around one of the earliest known air resistance wings known. The radiator used in the plane was especially designed for it in an endeavor to cut down resistance and was built up of hollow plates mounted on the sides of the fuselage as fins. A retractable radiator was fitted into the bottom of the fuselage. The modification providing a radiator modification of very low resistance for these days. It is of interest to note that the original wing surface type radiators were laid out for use on this airplane but were never built as the pressure of time was too great to permit these modifications and proper timing before shipping the plane to France. A serious error was made in the design of this plane in that it was laid out to land at a speed of between 90 and 100 m.p.h.

Mr. Wait, who is now Chief of Design of the Berliner-Joyce Aircraft Corporation, was engaged on the design of the racers of which he writes in this article. Beginning with the famous "Texas Wild Cat" he relates of the design improvements made on speed planes up to the present time.

An interesting point that he brings out is that the greatest increase in speed, aside from those due to increased horsepower, were obtained by modifying the shape of the nose and by developing wing sections with a lower minimum drag and a higher maximum lift.

No such landing speed had ever been attempted before, and it was only considered possible due to exaggerated reports having been made concerning the enormous size and smooth landing fields which would be available in France. With this in view even the shock absorbing systems were eliminated from the landing gear wheels the tires being cemented upon to absorb the shocks of landing. This plane was test flown in this country by Mr. Roland Rabbits, who sat at this time the exact top pilot for the Curtiss Company and the holder of the world's altitude record. These first tests were made by substituting a high lift large area monoplane wing for the racing wing that the plane was designed to carry. The tests were flown at Haverhill Field on Long Island, and during these tests one of the first recorded occurrences of wing flutter was observed. Rabbits took the plane into the air and crested the field several times at a relatively low speed. He then speeded the motor with and commenced a dive across the field at an altitude of about 500 ft. As he passed overhead at an estimated speed of approximately 175 m.p.h.

Design



WILLIAM W. WAIT, JR. in front of the "Texas Wild Cat" plane with which he won the Gordon-Bennett Race in 1926.

180 m.p.h. the wings were actuated to flutter so violently that all believed that they were about to fall off. Rabbits immediately cut the motor and landed. He reported that as the plane attained speed, the control stick was wrenched from his hand and the stick violently thrashed back and forth between his hands, leaving them almost to a pulp. A subsequent structural test showed that this was due to the "flapping" action of the ponderous ailerons with which this ship was fitted, which were mounted directly on the trailing edge of the wing and fluttered violently when the incidence of the wing reached a certain critical angle causing the air flow to be affected the ailerons. This wing proving a failure for the above reasons, an auxiliary set of lower panels were hurriedly built and shipped with the plane to France with the idea of flying the plane as a biplane for test flight in France.

UPON ARRIVAL in France Rabbits flew the plane and had a wilder ride than he did in the race on Long Island, the plane being absolutely unstable longitudinally.

Traveling at a terrific speed for these days, Rabbits made one circuit of the field and approaching a landing passed completely over and landed without damage to a plowed field almost half a mile distant. A new tail was hurriedly laid out, installed and completed the night before the plane was due on the flying field for the race. Early the next morning Rabbits took off and flew cross-country to the field, where in attempting a landing he struck a cross ditch, causing a wheel to collapse which completely wrecked the airplane and severely injured Rabbits. There is no doubt but that this plane was fast enough to have won the race easily had it not crashed, as performance estimates made for it showed a speed in excess of 200 m.p.h. and the flight tests seemingly bore out this estimate. These experiences proved the necessity of completely steadying, straightening, and testing a racing airplane before any attempt is made to make it competitive. Any attempt to do otherwise meant inevitably crash in failure.

The next year two racing planes were designed and built for the United States Navy around the same Curtiss engine which was used in the Gordon-Bennett plane, except that it was three-drive instead of geared as in the Gordon-Bennett plane. These particular airplanes failed to utilize the knowledge gained from the Gordon-Bennett plane and were built with relatively large fuselages, a relatively useless wing structure and landing gear and were equipped with French Lorraine radiators. They proved to be not nearly as fast as the previous planes, showing only about 180 miles an hour



The 1928 Curtiss Col. race, "Texas Wildcat"

though the horsepower of the engine was 425 as against 400 in the Gordon Bennett plane.

In 1921 two wing planes were built for the U. S. Army to be flown in the Pulitzer Trophy Race at Dayton that year. The wing area of these planes was fixed, as they were primarily designed to land at 75 m.p.h., which was the speed required by the racing rules. They were equipped with the first Curtiss D-12 engines, which developed approximately 465 hp as installed in the planes. The fuselages of these planes followed closely the lines of the Gordon Bennett racer, but was laid out to be even smaller. The wing structure was extremely clean, consisting only of the wings, four flying wires and two leading wires, a central cabane strut and two tapered crossplane struts. A new wing section known as the C-27 was used.

Wing-surface type radiators were fitted and a landing gear consisting of only two struts, a cross strut and two shock absorbers were retained. The tail dabs were simply laminated factory springs extending almost horizontally at the rear of the fuselage. These planes were extremely fast and were probably the first planes ever successfully flown which were capable of exceeding 200 m.p.h. in level flight. During the test flights which were made by Lawrence Mumford and Mangham, the pilots found them to be so sensitive that both of them reported great fatigue occasioned by flying them. On Lt. Mumford's flight he attempted to turn at high speed immediately over the observers at the field and completely rolled the airplane in the attempt, so sensitive was the machine to so small a slip at these high speeds. One of these planes flown by Lt. Russell Mangham was the Pulitzer Trophy Race at a speed of 205.5 miles an hour, which was the first time any plane had ever exceeded 200 miles an hour in competition.

The next year two racers were built for the United States Navy to be flown in the Pulitzer Trophy Race to be held in St. Louis that year. These planes were considerably modified from the 1922 Army design. The fuselage maintained the same round cross-section but was built slightly longer, and a different shape of nose was built into the cowling over the engine. An entirely new type of wing structure was used, the cabane strut

being completely eliminated and the upper wings laid into stream-line slots off the top of the fuselage. The lower wings were considerably smaller and were similarly mounted on the bottom of the fuselage. A new wing section developed in the wind tunnel especially for these racing planes and known as the C-42 was used, and wing-surface radiators were fitted. The landing gear was still further cleaned up by building the shock-absorbing system into the wheels and reducing the cross strut to a very small crossbar tail. The front struts were run to the center of these wheels, improving the angle of the wire and considerably reducing the load on the front wing beam, giving a lighter stress of less resistance and concentrating both the landing and flying loads at the same point as the fuselage. A novel control system was installed with a variable gearing which provided much less sensitive control of the elevators and rudder near neutral, but did not limit the full angular throw of these controls at all. These planes were equipped with Curtiss D-12A engines developing approximately 530 horsepower. They were also equipped with the first Reed metal propeller to be flown in competition. They were flown by Lts. Williams and Brow of the Navy, and Lt. Williams was the Pulitzer Race with his plane at a speed of 248 miles an hour, or almost 40 miles an hour faster than the speeds attained in the same race the previous year. Later on Lt. Williams and Brow engaged in a speed duel at Mitchell Field, Long Island, in an endeavor to set a new world's three-kilometer speed record. At this time diving was permitted during such contests, and during this duel Lt. Williams finally set the record at over 266 miles an hour by diving into the course from a height of nearly 10,000 ft. In 1925 new racing airplanes were built jointly for the Army and Navy. These planes differed in all respects, were modification of the type built for the Navy in 1924. They were equipped with Curtiss V-800E engines, developing approximately 600 hp and equipped with a crank-shaft extension which permitted a better stream lining of the nose of the fuselage. A new forged type Reed metal propeller was used. The wing structure and wing radiators were the same as used in 1922, with the exception that a new wing section was used. It had been developed particularly for these airplanes and was

known as the C-40 section. During the course of these tests eleven different wing sections were tested to the limit, each one being a modification of some preceding series. These planes were flown by Lawrence Williams of the Army and Bertie of the Army, and attained a high speed in level flight in excess of 290 miles an hour. Lt. Bertie was the Pulitzer Trophy Race with his plane at a speed of approximately 340 miles an hour. The same planes were flown later in the year at Baltimore, Maryland, by Lts. Cuddeby and O'Brien of the Navy and Donnell of the Army, in the Schneider Trophy Race which Lt. Donnell won from Great Britain and Italy. A day or so later Lt. Donnell set a world's three-kilometer record for airplanes with his plane, attaining a speed of 245.2 miles an hour in level flight.

In 1936 five same airplanes were equipped with a new version of the Curtiss V-1400 motor known as the V-1535 and developing 750 horsepower. Prototypes of these shapes were fitted and a set of new cowlings were built around the new engine permitting a better shaped nose to the fuselage. This plane was flight tested at Port Washington, Long Island, by the late Lt. Conant, during which time he attained a level speed over a measured course in excess of 255 miles an hour. While en route to Norfolk, the winner of this year's Schneider Trophy Race, Lt. Conant was unfortunately killed in



Curtiss-Vought V-1535 as installed in Lockheed in the 1937 Schneider Cup Race

an accident in his present type airplane. Upon the arrival of his racing plane at Norfolk it was test flown by Lt. Chapman of the Navy. During the course of this flight the wing radiators were almost completely destroyed through deterioration of the motor causing an excessive stream lineation. This deterioration was caused through an improper manner of fuel being installed in the tanks in error. As no spare radiators were available for this plane an attempt was made to repair the damaged ones in an endeavor to keep the plane in the race. The result of this endeavor was a set of radiators that cooled successfully but which considerably deformed the leading and trailing edges of the wings. Test flights showed that this slight deformation in wing contour had cut nearly ten miles an hour in speed. Major DeBernard later won this race for Italy. This



Best Acroft with the Pulitzer Trophy and the Curtiss Vought V-1535

same airplane as a biplane was refitted to have a high speed in excess of 270 miles an hour.

From the foregoing it will have been seen that a series of airplanes were built around practically the same line fuselage, of approximately the same weight and wing area and with only minor modifications allowing high speeds ranging from approximately 200 miles an hour to over 290 miles an hour. This great increase in speed was attained through the refinement in detail of both airplane and engine. The greatest increases in speed, aside from that due directly to the increase in engine horsepower, were obtained by modifying the shape of the nose and by developing wing sections with a lower resistance drag and a higher aerodynamic lift. Smaller increases were due to smoother cowlings, cleaner fittings, lighter structures permitting relatively smaller wing structures and the general cleaning up of the minutest detail of the airplane.

When the British and Italian racers first came to this country in 1925 the engines were good, but the detail design of the planes had not been carried to the extremes of cleanliness of the American entries.

This next year was a different story. The Italians sent over a fleet of racers that were refined to the last degree. Their designer had utilized the best features of all the previous racers, and as a result they won the race handsily. The next year the British also produced racers, built by two separate firms, that were even cleaner of detail and refinement. The engine manufacturers had worked with the airplane builders, and the combination produced racing airplanes that in detail design will be hard to equal. As a result the British won the Schneider Trophy that year.

Each year speeds are increasing higher and higher and that each year added emphasis is laid on the necessity for cleaning up the last bit of parasite resistance, as it is useless to hope to attain higher speeds by a mere increase of power alone. The power increase necessarily requires more fuel and larger engines, and the resistance increases as the square of the speed. It is therefore evident that to increase our present speeds appreciably we must cut down the resistance of the planes by a constant endeavor to eliminate even the smallest details causing drag and to design our engines to obtain the maximum power with the minimum of forced air and weight.



Best flying plane in the Pulitzer Trophy Race in 1925

THE Los Angeles Races

By CHARLES F. McREYNOLDS

ONE YEAR AFTER

MORE than 200,000 people paid admission to the 1928 National Air Races and Aviation Exposition held at Mines Field, Los Angeles, an average of about 25,000 people daily for the nine days during which the show lasted, and it was estimated that a total of approximately 3,000,000 people viewed the aerial events from points of vantage outside the field proper. This is said to be the greatest mass of people that has thus far been brought together to view a single series of aerial events. Counting as it did a little more than a year after Lindbergh's flight to Paris, and on the heels of the enthusiasm which followed to meet with his American Tour, non-stop flight to Mexico City, and Pan-American Good Will Tour, last year's air race program was the logical climax of the extraordinary interest in aeronautics which dominated aviation activities during the latter portion of 1927 and much of 1928.

Supported by an impressive flood of free publicity in the California newspapers, the 1928 air races proved to

be the greatest single factor in crystallizing air enthusiasm throughout southern California that had manifested itself since the start of the race for aviation. It was the first time that an Aeronautical Exposition had been staged in conjunction with the races, and the public took full advantage of the opportunity to look up aviation lore.

NEVERTHELESS, a year after the 1928 events, many people are still asking whether or not they were successful. It is hard to answer such a question offhand, for it is so difficult to measure the success of such an affair, difficult to know the real significance of the kaleidoscopic pattern of races and show exhibits, their reaction on the attending crowds and the resulting benefit to the aviation industry.

From a financial standpoint the 1928 National Air Races were a decided success. The Air Race Association broke even on the cash accounts, and so not lost any money. Many of the exhibitors, however, were forced

to charge off heavy expenditures to advertising.

The 1928 show was not a selling show and some firms were disappointed by the lack of cash customers for their products. But the time was not ripe for sales. The public came to be shown, as outsiders seeking to learn the value of a new industry and act as potential purchasers of this plane or that.

Better than making actual sales, the great lesson of the 1928 show was laying the ground work for the steady expansion which has followed. New firms gained prominence overnight, and the industry learned to respect such names as Warner, Kinner, Anshutz, and Lockheed.

Young organizations made without success and large Eastern firms involved in the air-industries of southern California, and strengthened their sales and service representation in this territory. Had the 1928 events accomplished nothing more, they would have been a winning success for the industry in which the industry was made conscious of the possibilities of the West, in the immeasurable advantage of that section during this past year, as records covering any phase of the industry's growth will readily demonstrate.

ONE OF THE MOST VALUABLE of data and information covering all phases of the 1928 events, too precious to stand out with clear-cut significance in the light of later developments. For nine days the spectators thrived in the swarms of "San Hawks" and "Ministons," held their breath while delayed gasoline parachute drops were staged, and screamed hysterically when smoking engines, and diving bombers roared down on the stands at 300 m.p.h., and during that time the air buses and searic flight operators reported an amazing slump in traffic. Army personnel planes too closely resembled the ordinary three-place commercial biplane for the average man and he left the day's races with increased respect for the capabilities of aircraft and a very increased desire to possess a specimen to all such activities. This sentiment continued for some time after the air races were over, and it was not until early in 1929 that some flights occurred from a slump brought on by the very events which made the success of the races possible.

However, on Sunday, Sept. 15, the tenth and last day of the races, there occurred a notable business-building incident which was in a way entirely separate from the air race program. With approximately 35,000 spectators jamming every point of vantage for a view of the

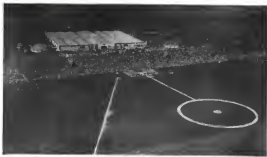


Midwest team of the "Three Sea Hawks" making a show loop.

showing events there was staged a "parade" of nine tri-engined Ford Tri-motors and 15 Ryan Bombers. Flying in single file, these 24 large commercial planes passed above the crowded stands in steady and almost laboriously solemn fashion when compared to the antics of the small planes which had been holding the public's eye for nine days, and as each plane passed above the crowds, showers of flowers were scattered overhead by men. Then 100 young Hollywood picture beauties who were hourly enjoying the flight. Soon the planes landed, bowed up to the stands, and the girls joyfully clambered out for congratulations, here to re-enter the planes and fly back to the home port.

It was a great "scare" and a clever piece of showmanship on the part of Jack Madeline, whose company furnished the planes but the immediate reaction of the public was that this had found an outlet for their new enthusiasm for aerial activity. Much of the success which has since attended Western air transport firms during the first seven months of 1929 must be credited to the enthusiasm generated by the air races and crystallized by this parade of large, steady-flying commercial airplanes. A large percentage of the public themselves looked forward to flights in places of the large transport type, and with the arrival of ideal flying weather in the early spring of 1929 their desire was soon satisfied.

Air travel over established lines flying tri-engined equipment has increased amazingly since January of this year. With a total pay passenger list of approximately 1,800 for January, the transport lines have expanded so rapidly that 8,400 pay passengers were carried in or out of Los Angeles during the month of July over regularly scheduled air routes. There were three established transport lines in January, and by July there were six operating out of Los Angeles. In January there were six tri-engined planes operating either out of or into Los



Platz 1 for the 1928 National Air Races, in front of grandstands and exhibition building at Mines Field, Los Angeles.

August 24, 1939

Angles terminals daily, and in July there were 38 daily. In January there were but two air terminals used by tri-engined transports and in July there were four such terminals, at one of which four different air transport companies were operating. Some flying has been suggested by the large transport companies and is meeting with real success. During the evening when this is being written, six different tri-engined transports have flown over Los Angeles to give neighbors a view of the city at night.

At the present time traffic over the established air transport lines is the pulse of the aviation industry. If the public is to fly at all it will first fly over regularly scheduled and safely operated lines. Therefore the passengers of such services may be counted as barometers for the further advancement of the aviation industry. Profits must be earned by the air lines, planes must pay profits on the investment placed in them, or there will be no reason for an aviation industry. The fact that Los Angeles airlines are carrying about 10,000 passengers a month over regular air routes, exclusive of charter planes and scenic flights, that several of the transport companies are already reporting profits and traffic mounting rapidly, and that much of this air line percentage must be credited directly to the influence of the 1938 Air Races, should prove for all time the real value

of those events. Not only is such air line activity of value to the immediate territory within which it is conducted, but the success attained must be an inspiration to the whole industry, and the lessons learned and methods developed through handling such a volume of traffic must prove invaluable as a foundation for expansion elsewhere.

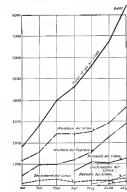
MANY OTHER RESULTS of the 1938 races are evident as generally increased activity, but it is not possible to define accurately the influence which those events has had over such activities. For instance, the general aviation course which follows the races made it possible for the California Aircraft Operators' Association to build up a strong organization which has influenced the trend of aviation legislation in the State of California. As a direct result of this organization's efforts, the State Bill has been made a state law, and it will hereafter be illegal for any plane or any pilot not federally licensed to operate within the state. This law substantially wipes out several hundred war-time planes which should long since have been phased, and while some present handling will be effected, the ultimate result will be vast food for the progress of aeronautics in this state and throughout the country. Other evidence of the benefits brought about by the races are seen in the 1939 history of



Excitement of spectators lining the Flyway to the spectators.

August 24, 1939

the Southern California Chapter of the National Aeronautic Association. Prior to the 1938 races this group had been fairly active but always quite small. A reorganization was effected shortly after the air races and for the first five months of 1939 there were a total of 2,500 persons present at the five monthly banquets, approximately 1,000 being present for one meeting alone. Another group affected by the races has been the Los Angeles Junior Chapter of Cosmochem, which has declined to major efforts for the year 1939 to sponsoring aviation in southern California, chiefly as a result of



A graphic presentation of the increase in number of passengers carried by air lines from Los Angeles during the first seven months of 1939.

aviation generated by the air races. The same general spirit crops up constantly in other civic groups, and it is evident that much of southern California's air-enthusiasm can be traced directly to the 1938 events.

Aside from the general stimulus given to the development of aircraft and aircraft engine factories in this territory, one of the most important results of the 1938 races was the recognition by the public of a need for airports. Prior to the races there was no well-developed investment field in southern California, with the possible exception of Van Field. Now there is the Aero Corporation of California Airport, Los Angeles Municipal Airport at Inglewood Field, Clover Field, Santa Monica Airfield terminal of Western Air Express, the Grand Central Air Terminal Glendale and the Los Angeles Metropolitan Airport, all equipped in the most modern way for handling all aircraft operations, and two major



"The Three Runways" of the 1938 races led to airport building in phase 1.

airports are under development, in addition to the fact that great improvement has been made at literally dozens of smaller airports throughout southern California.

It is evident that many great benefits may be singled out to show how the 1938 National Air Races have helped southern California. It is not so easy to point out the ways in which the air races helped the industry as a whole, but the benefits have been close the last one.

Certainly the races greatly stimulated the local market to the advantage of the industry generally, and in some cases large and fortunate were brought in the groups manufacturing planes or engines which was favor at the moment.

Probably the big factor, naturally, is the demonstration of a real need for an annual program of progress which will clearly mark the passing of each year's advancement in aviation. It has been rather well established that a large selling and introductory effort should be held each spring before the real opening of the retail selling season, at which time factories will announce their models for the coming selling campaign and will strengthen their salesmen for the season's effort. But it is just as important, for the good of the industry, that a great show and air race program should be held at the close of the season in order to display definitely the capabilities of planes which have been tried by a season of use, and to indicate the greatest popularity of existing types, so that engineering departments may avoid laboring through the winter to improve what has failed to find favor with the flying public.

The 1938 National Air Races and Aeronautical Exposition showed a period of great popular curiosity about aviation; now we look for the 1939 Cleveland Show and National Air Race program to climax the greatest business year that aviation has yet enjoyed. In 1938 we learned that we were going ahead with an unbroken public interest in the progress of aviation, but at the close of the coming show we should have more clearly than has yet been possible where we are going with the aviation industry.

DO AIRPLANE RACES

Stimulate AIRPLANE

By E. M. LAIRD
President, E. M. Laird Airplane Co.

LIKE EVERY INDUSTRY that offers something new to the public, we of the aviation business have a twofold selling job. First, we must sell the public on flying—as an industry we must sell the use of our product. Only after this has been accomplished can we hope, as individual manufacturers, to sell airplanes.

Airplane races are an important factor in accomplishing the first step of the industry's sales program. Airplane races are the circus parade of the airplane industry. They are the means of dramatizing our wares. More printer's ink and newspaper space expended on a one coast-to-coast record flight than on all the millions of miles flown through fog, storm and cold by scheduled aircraft, express and passenger lines.

We cannot complain of our progress. Undoubtedly the public is becoming air-minded. But it is not yet air-enthusiastic—and there is a vast difference. The business executive who buys a "extra paper" to read about the latest trip of a German dirigible, is far from planning the purchase of a plane for his own use—or even from using an established, reliable air-passenger line.

Consequently, air races still have a very distinct purpose. They make it possible for aviation to break into the news columns of the daily papers—where John Jones can digest the latest aeronautical news together with his hens and eggs and his market reports. Air races provide the headline which enables the lady to gossip and remember names of manufacturers, names of pilots, the speed, safety, and special characteristics of airplanes, etc.

So much for the indirect value of air races to publicity itself. They also bear direct and immediate fruit. For one thing, they attract crowds to the flying field, where the public can see the everyday business of aviation in progress. They can watch the air-mail ships wait with rubber noses until the post-office truck has dashed up and transferred its load. When the truck has not yet cleared the field, they can see the ship already disappearing over the horizon.

They can see the sky-liners take off and land with their passengers as regularly and successfully as railroad trains. When, when she has watched this very company's plane several times, is much less likely



Helman "Speeding" is of the type used by "Speed" Helman in winning the Greater Trophy Race. Note the speed line wheel rotation reading.

SALES?

to object when hobby sentences a business trip via airplane.

Another thing: Few airplane dealers can as yet expect a volume of business that would justify a constantly loaded display room. Except for airshow exhibitions, their only chance to exhibit their plane is to bring the public out to their airport hangars. And races do draw the crowds!

It is well, here, to sound a note of warning: Every airplane accident offsets the beneficial effect in the public mind of a thousand successful flights. Let's have no accidents! Thrill, yes. The crowd expects thrill. But the crowd can be made to understand that stunt flying is in no way a part of commercial aviation. And the airport management can do much (by warning clearly the centrals of race entries and in planning and rigidly enforcing safety rules) to prevent all possibility of mishap during races.

What has been said so far, covers only the value of air races as a means of educating the public. For the winners, at least, there is always a gratifying incentive within the trade. Nothing is so convincing as performance!

I speak from experience. After winning one of the most important races recently, we office received letters and telegrams from every corner of the country, inquiring about price, delivery date, etc.

The inquiries came from two distinct groups of prospects. There are the sportsman-spirited men. They like to know that they own a winner—that they can outstrip anything in their class. An airplane appeals to the sportsman-pilot like a thoroughbred race-horse—and he takes the same personal pride in its speed and performance.

Many inquiries also come from professional pilots



Above: E. M. Laird, president of E. M. Laird Airplane Company. Below: a group which has been making records since Laird planes. Left to right: Anthony MacArthur, MacArthur, Phil Williams, W. E. Bellinger, C. W. Robinson, and Frank Taylor.



Nearly every new airport is dedicated with speed competitions offering lucrative cash awards to the winners. With airports being opened almost weekly, the price of a fast plane can quickly rise back the purchase price of his ship. To have a fast airplane is a good thing.

In this country, where no government subsidy seeded the infant aeronautical industry, the cash awards given by aircraft race associations did much to aid its growth. Air races have here, and have not yet ceased to be, need—provided, of course, that they are carefully managed.

GENERAL NEWS

Closed Course
Events Total 35To Employ Race Horse
Starts, Australian Paravist

CLEVELAND (cont.)—The schedule of closed course events and events in the National Race Horse Show herewith. A feature of the races will be the introduction of "race born" stock, in which competing drivers will be bred up to be faster together. They will be in a point approximately 10 mi. are lost from Cleveland, and a public and race track that completing a "winning lap" before beginning on their return, the presented number of laps designated for the particular event.

In the events where prize can given for efficiency, the following formula will be used:

(Per lap) (in miles per hour) x

100 = Points

The four events known as "Australian paravist" in which, following a headstart race, any plane must drop out as soon as it has been passed, is expected to prove interesting. Following are the events, specifications, and amounts of prize money as tentatively announced.

Closed Course Events

No. 1—Warren, 25 laps of 100 miles. No. 2—Cleveland, 10 laps of 100 miles. No. 3—Cleveland, 10 laps of 100 miles. No. 4—Cleveland, 10 laps of 100 miles. No. 5—Cleveland, 10 laps of 100 miles. No. 6—Cleveland, 10 laps of 100 miles. No. 7—Cleveland, 10 laps of 100 miles. No. 8—Cleveland, 10 laps of 100 miles. No. 9—Cleveland, 10 laps of 100 miles. No. 10—Cleveland, 10 laps of 100 miles.

No. 11—Cleveland, 10 laps of 100 miles. No. 12—Cleveland, 10 laps of 100 miles. No. 13—Cleveland, 10 laps of 100 miles. No. 14—Cleveland, 10 laps of 100 miles. No. 15—Cleveland, 10 laps of 100 miles. No. 16—Cleveland, 10 laps of 100 miles. No. 17—Cleveland, 10 laps of 100 miles. No. 18—Cleveland, 10 laps of 100 miles. No. 19—Cleveland, 10 laps of 100 miles. No. 20—Cleveland, 10 laps of 100 miles.

No. 21—Cleveland, 10 laps of 100 miles. No. 22—Cleveland, 10 laps of 100 miles. No. 23—Cleveland, 10 laps of 100 miles. No. 24—Cleveland, 10 laps of 100 miles. No. 25—Cleveland, 10 laps of 100 miles. No. 26—Cleveland, 10 laps of 100 miles. No. 27—Cleveland, 10 laps of 100 miles. No. 28—Cleveland, 10 laps of 100 miles. No. 29—Cleveland, 10 laps of 100 miles. No. 30—Cleveland, 10 laps of 100 miles.

No. 31—Cleveland, 10 laps of 100 miles. No. 32—Cleveland, 10 laps of 100 miles. No. 33—Cleveland, 10 laps of 100 miles. No. 34—Cleveland, 10 laps of 100 miles. No. 35—Cleveland, 10 laps of 100 miles. No. 36—Cleveland, 10 laps of 100 miles. No. 37—Cleveland, 10 laps of 100 miles. No. 38—Cleveland, 10 laps of 100 miles. No. 39—Cleveland, 10 laps of 100 miles. No. 40—Cleveland, 10 laps of 100 miles.

No. 41—Cleveland, 10 laps of 100 miles. No. 42—Cleveland, 10 laps of 100 miles. No. 43—Cleveland, 10 laps of 100 miles. No. 44—Cleveland, 10 laps of 100 miles. No. 45—Cleveland, 10 laps of 100 miles. No. 46—Cleveland, 10 laps of 100 miles. No. 47—Cleveland, 10 laps of 100 miles. No. 48—Cleveland, 10 laps of 100 miles. No. 49—Cleveland, 10 laps of 100 miles. No. 50—Cleveland, 10 laps of 100 miles.

No. 51—Cleveland, 10 laps of 100 miles. No. 52—Cleveland, 10 laps of 100 miles. No. 53—Cleveland, 10 laps of 100 miles. No. 54—Cleveland, 10 laps of 100 miles. No. 55—Cleveland, 10 laps of 100 miles. No. 56—Cleveland, 10 laps of 100 miles. No. 57—Cleveland, 10 laps of 100 miles. No. 58—Cleveland, 10 laps of 100 miles. No. 59—Cleveland, 10 laps of 100 miles. No. 60—Cleveland, 10 laps of 100 miles.

No. 61—Cleveland, 10 laps of 100 miles. No. 62—Cleveland, 10 laps of 100 miles. No. 63—Cleveland, 10 laps of 100 miles. No. 64—Cleveland, 10 laps of 100 miles. No. 65—Cleveland, 10 laps of 100 miles. No. 66—Cleveland, 10 laps of 100 miles. No. 67—Cleveland, 10 laps of 100 miles. No. 68—Cleveland, 10 laps of 100 miles. No. 69—Cleveland, 10 laps of 100 miles. No. 70—Cleveland, 10 laps of 100 miles.

No. 71—Cleveland, 10 laps of 100 miles. No. 72—Cleveland, 10 laps of 100 miles. No. 73—Cleveland, 10 laps of 100 miles. No. 74—Cleveland, 10 laps of 100 miles. No. 75—Cleveland, 10 laps of 100 miles. No. 76—Cleveland, 10 laps of 100 miles. No. 77—Cleveland, 10 laps of 100 miles. No. 78—Cleveland, 10 laps of 100 miles. No. 79—Cleveland, 10 laps of 100 miles. No. 80—Cleveland, 10 laps of 100 miles.

Consolidated Aircraft
Adds Two Plane Firms

BUFFALO (N. Y.)—Aeroplane by Consolidated Aircraft Corporation of airplane manufacturing company, National Aircraft Service, Inc., this city, and 100 acres of land located near Buffalo added the Canadian Aircraft Corporation, Buffalo, N. Y., to its list of subsidiaries. In addition, the company has acquired a substantial interest in the American Aircraft Corporation, Glendale, Calif.

These manufacturing companies appeared as first aircraft corporation, Buffalo, and Thomas-Morse Company, Elmhurst, N. Y. The first corporation will continue as an independent unit, acting as commercial sales representative of the Consolidated group. The second will be further enlarged when plans for building a factory and constructing an airport on the new Canadian site are carried out.

Two entirely new models will soon be tested at the Buffalo plant. One is a high-speed, semi-passenger of metal alloy monoplanes, powered with a Super D Pratt & Whitney Hornet engine. The second is a 20-passenger "Commodore" type built with two Hornet engines. Plans of the second type will be used by New York, N. Y. and the American Aircraft Corporation, Buffalo, N. Y., in its service to South America.

Again to Award B & T Trophy

NEW YORK (N. Y.)—This will be the second time the award will be given to ART Gould last night. J. H. Barker, president of Barker & Bolen, Inc., entering upon his 10th anniversary of the "B & T" Trophy will be awarded to the pilot who in connection with the National Air Races and the aviation organization, in the opinion of the sponsoring judging events and traveling agencies, the most noteworthy achievement in aviation. The trophy will be awarded to the pilot who in connection with the National Air Races and the aviation organization, in the opinion of the sponsoring judging events and traveling agencies, the most noteworthy achievement in aviation. The trophy will be awarded to the pilot who in connection with the National Air Races and the aviation organization, in the opinion of the sponsoring judging events and traveling agencies, the most noteworthy achievement in aviation.

Universal School Approval

MINNEAPOLIS (Minn.)—An "Approved School Certificate" has been granted Universal American Schools of Minneapolis, covering transport, limited flying, and private pilot courses, both flying and ground.

SHOW BRIEFS

Officials announce that approximately \$100,000 worth of aircraft, engines, and accessories will be on display at the exposition.

The show, closely allied with dinner country at spare moments between the years. These have been changed by J. G. Smiley, executive administrative officer, Wright Field.

Army patrol, attack, and bombardment planes will fly in special demonstration. A number of National Guard units will also participate.

Eighteen Navy flying planes will be on display. The Navy will also take part in the display flying.

The Navy dirigible Los Angeles is scheduled to arrive at the airport Wednesday, Aug. 24. A ship will have been provided to receive the dirigible.

A dirigible, equipped National Guard plane will be shown in the open day to broadcast to radio stations points.

A number of Goodyear-Zeppelin blimps will conduct the opening day parade which is to include some of Akron.

Chief Henderson, it is reported, wrote the lyrics for "Wings of Love," the musical show scheduled to follow the close of exposition each night.

Decorations at the Auditorium have been laid out with an eye to accommodate tradition. Colored wind cones have been set by fans after the model.

Months of planes flying in formation along the walls at the West Wing and Exposition grounds.

In honor of Einstein, "Light's Golden Jubilee" are now from Cleveland to Miami, Fla., and return to Cleveland the night of Sunday, Aug. 27. The start will be through the crowd because of two large airships above the Auditorium.

Col. Carl F. Egan, of Cleveland, has been appointed by the N.A.A. to referee at the 1939 National Air Races.

A total of 1,500 planes are expected to make approximately 10,000 landings at the airport.

It is estimated that over \$100,000 will be used for the races, and over \$200,000 are expected to visit the exposition.

The night glider events on the program were arranged by Donald Ward, of Detroit, National Glider Association manager.

Advance ticket sales during the first twelve days amounted to over \$400,000.

Both admission to the exposition and to the report for the races has been set at \$1. A special child combination ticket admitting to both is offered at \$1.50.

A special \$10 ticket would be a grandstand seat in the race day, three admissions to the Auditorium, and three admissions to the musical extravaganza. Private boxes for the races are also offered for \$200, \$250, and \$500, respectively.

Cleveland Goal
Of Nine Derbies

Pilots Racing in Ohio City
Will Cross Finish at Show

CLEVELAND (cont.)—Nine air derbies, involving from as many pilots of the country and foreign, are scheduled to end at the Cleveland Municipal Airport on various afternoons during the period of the show.

These flying spectacles, announced in the Howard A. Day Derby, a feature which is introduced this year for the first time. In addition, to prize money and other awards, Cleveland's Pennant Trophy Company, maker of Aerol trucks, has donated a valuable trophy to be competed for annually in this event. It will be awarded for efficiency computed by the formula:

(Average mile x 10) = Points

Points will be given only when there are at least five starters in each event and five entries in each class when the events are so divided. Tentative times and amounts of prizes are as follows:

WOMEN'S AIR DERBY

Class C, 25-31 mile, displacement, Class C, 25-31 mile, displacement, Class C, 25-31 mile, displacement, Class C, 25-31 mile, displacement, Class C, 25-31 mile, displacement.

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AIRPORTS AND AIRLINES



Western Union Starts Express With Colonial

NEW YORK (N.Y.)—An innovation in express air service has been announced here under an agreement between the Colonial Airway System and the Western Union Telegraph Company. The plan is the initiation of the latter's messenger service for collection and delivery of parcels and the air transport company's twice daily service to each direction between this city and Chicago. It is expected that the combination of these two will provide four hour service for parcels from sender to one city or receiver in the other city.

The reader need not call a Western Union messenger boy in the usual routine and the package is delivered to the next available passenger plane, the flying time between the cities being less than 2 1/2 hr. On arrival at the end of the air route the packages are delivered to the Western Union for distribution. Transportation between airports and business sections of each city is taken care of by the buses operated for the accommodation of the passengers holding air tickets.

The rate is \$4.

The minimum rate is given as \$5 per package, the maximum weight of each package being 5 lb. This service will supersede the express accommodation formerly provided through an operation with the Railway Express Agency. The Colonial System's contract with the Agency has been ended. Under this agreement, express was carried only on the Colonial mail flights which left Boston for New York at night and left New York for Boston very early in the morning. Package rates were extremely small, according to the Express Agency.

Colonial started flying express for the American Railway Express in 1950. The cancellation of the contract represents no change in the Express Agency's air service policy, it is said, and the agreement with other companies will be continued, according to present plans.

It is considered likely that the Western Union scheme will be extended to include other office systems. This extension probably will be applied first on the other routes operated by Colonial (New York-Montreal and Albany-Cleveland) and also on other long routes controlled by The Aviation Corporation, which Colonial is now, such as Denver Air Lines, Interstate Air Lines, Southern Air Transport and Eastern-Railair.

Studying Weather Changes

CHENEY (Wyo.)—With the approval of the government weather reporting service, airport weather observers here started a survey on possible changes in the timing of weather conditions on this route. As a result of these observations it is expected that an additional weather reporting service may be established which would enable pilots to know in advance more thoroughly what the weather probably will be when they arrive at their destination.

Texas Port Nets \$4,702.20

TULSA, Okla.—The net profit of the Tulsa Municipal Airport during July was \$4,702.19 before depreciation and has declined. The June report showed \$4,365.13.

Showing the Location of Alaskan Airports



THE 71 airports existing or proposed in Alaska have been plotted by the United States Geological Survey on the accompanying map. The locations of the airports are listed by numbers as follows: 1, Anchorage; 2, Bethel; 3, Barrow; 4, Bettendorf; 5, E. E. Elmer; 6, Fairbanks; 7, Fairbanks; 8, Fairbanks; 9, Fairbanks; 10, Fairbanks; 11, Fairbanks; 12, Fairbanks; 13, Fairbanks; 14, Fairbanks; 15, Fairbanks; 16, Fairbanks; 17, Fairbanks; 18, Fairbanks; 19, Fairbanks; 20, Fairbanks; 21, Fairbanks; 22, Fairbanks; 23, Fairbanks; 24, Fairbanks; 25, Fairbanks; 26, Fairbanks; 27, Fairbanks; 28, Fairbanks; 29, Fairbanks; 30, Fairbanks; 31, Fairbanks; 32, Fairbanks; 33, Fairbanks; 34, Fairbanks; 35, Fairbanks; 36, Fairbanks; 37, Fairbanks; 38, Fairbanks; 39, Fairbanks; 40, Fairbanks; 41, Fairbanks; 42, Fairbanks; 43, Fairbanks; 44, Fairbanks; 45, Fairbanks; 46, Fairbanks; 47, Fairbanks; 48, Fairbanks; 49, Fairbanks; 50, Fairbanks; 51, Fairbanks; 52, Fairbanks; 53, Fairbanks; 54, Fairbanks; 55, Fairbanks; 56, Fairbanks; 57, Fairbanks; 58, Fairbanks; 59, Fairbanks; 60, Fairbanks; 61, Fairbanks; 62, Fairbanks; 63, Fairbanks; 64, Fairbanks; 65, Fairbanks; 66, Fairbanks; 67, Fairbanks; 68, Fairbanks; 69, Fairbanks; 70, Fairbanks; 71, Fairbanks.

Pan American Reports 6,824 Passengers Carried

NEW YORK (N.Y.)—Pan American Airways and its associated companies—Pan American Grace Airways and the Mexican Aviation Company—carried 6,824 passengers and 161,592 lb. of regular and special mail during the first six months of this year, according to a report just sent by J. M. Eaton, general traffic manager of the system. The average passenger traffic was 1,136 persons monthly. The company claims an operating efficiency of 95.63 per cent during the period.

The Pan American network now covers about 9,700 sq. miles of territory, reaching such remote countries as Central and South America, in addition to a small island in the Pacific. About 1,350 sq. mi. of the above total are being flown by passenger planes. This service touches seven countries. As the present time it is operating 34 north-bound planes.

Use of One Frequency in Plane Radios Tested

WASHINGTON (N.Y.)—Tests recently completed at Mather Field of weather forecasts on the same frequency as the directional beams of radio beacons, have been judged satisfactory, as noted by E. C. Haggberg, chief of the Airway Division, Aeronautics Branch. If reports from pilots confirm these views of airway officials, this type of forecasting will be made a permanent feature of the radio service, it is noted. The Airway Division already has not served unaided tests that pilots accept this innovation.

Under the system of sending all the information over the airwaves that pilots use on the same frequency, the directional beams of the radio beacons are interrupted by remote control for periods of 3 min. at 15 min. intervals. During this 3 min. period when the beacons are in use, weather forecasts are sent out on the same frequency as that used for the directional beams. Thus the pilot receives directional information, weather reports and terminal communications at one listening of the dial.

In cases where broadcast companies desire to communicate with pilots, they must be planned in flight; they will be allowed time on the 3 min. weather report service. With announcements speaking at the rate of 80 words a minute it will be possible to broadcast 240 words in 3 min. It is believed that this will be sufficient to give all the information necessary about major and terminal weather.

Allocation of the 3 min. broadcast periods of the 15 min. intervals when the beacons are used, after station announcements at each interval, or every 15 min., reports on sector weather every half hour, and reports on terminal weather on the hour, is the responsibility of the intervals between terminal weather forecasts will be increased as the plan begins flying closer to test weather by planning releases in this service to bring them through.

To Discuss Asphalts for Ports

NEW YORK (N.Y.)—The application of asphalt as airport surfacing will be discussed at length at the eighth annual asphalt paving conference which will be held at Westchester County, N.Y., October 12 to November 1. The subject will be taken up under the leadership of Chief Engineer J. M. Simpson, who represented the paving at Port Columbus, Ohio.

Buses Over Airparking

WASHINGTON (D.C.)—Parade routes throughout the country have been requested again by President Eisenhower to cooperate with the Overseas Airparking Plan in the promotion of air-traveling. The plan, which is a joint effort of the Department of Commerce and the Department of Transportation, has been reported in quarters where politicians have reportedly supported the movement.

Make Progress on Huge Goodyear Airship Hangar



THIS is the partly completed hangar at Akron, Ohio, in which the Goodyear-Zeppelin Corporation will build two giant airships for the Navy and later construct a fleet of commercial dirigibles. The building will be 1,155 x 300 ft. wide and 200 ft. high when completed. About 7,000 tons of steel are going into the construction and 1,800 concrete piles have been driven into the ground to support the structure. The hangar is on one end of the Akron Municipal Airport, which is used, also, for heavier-than-air craft.

Open Joint Detroit Ticket Office

DETROIT (Mich.)—In order to facilitate routing of air passenger to airports in the United States, an inter-company and two-air line service, in cooperation with the Detroit Automobile Club, have agreed a consolidated ticket office in the downtown offices of the automobile club. Customers sponsoring the service are Great Lakes, Inc.; Northwest Airlines, Inc.; Western Air Express, and Capital Airways, Inc.

T. A. T. Operates At 38 Per Cent Loads

ST. LOUIS (Mo.)—Transcontinental Air Transport, Inc., is operating at an average passenger capacity in the first month of operations, according to statistics released at general headquarters here. Since the start of service July 8, planes have operated at 43 per cent capacity on the Eastern division between Columbia, G., and Weymouth, Gile, and at 33 per cent on the Western division between Denver, N. Mex., and Los Angeles.

Flying passengers carried totaled 43,014 in the month, 135 more the exact-to-exact journey, while the number of 280 such flights has been reported in quarters where politicians have reportedly supported the movement.

Begin to Assemble Super-Wal For Stout Line

PHILADELPHIA (Pa.)—One of the new Douglas Super-Wal 30-passenger aircraft, flying tests, recently to this country by the Douglas Aircraft Co., Inc., the size over the one Great Lakes plane, is being assembled at the Naval Aircraft Factory here. Four Hornets will be used in each.

Following assembly, the huge boats, which will be the largest commercial aircraft in this country, will be tested by Naval Engineers, Douglas plant, before they are flown by way of the Hudson River, Lake Champlain, and St. Lawrence River to Buffalo.

Charles D. Williams, who has been in Philadelphia for some months for the Super-D & C. Co. from supervising construction of the boats and observing the work at the Douglas plant, is now at the assembly here, with these details, Douglas factory mechanics, heading the fleet of skilled craftsmen placed at the disposal of the company by Commander Ralph D. Weyershaefer, head of the Naval Aircraft Factory. Engineers following the work of the boats, will be returned as soon as possible.

It is probable, Mr. Higgins reports, that the boats will see most of their service this year along the Atlantic Coast, since the Great Lakes will be open to navigation only a short time after the boats are assembled. There is reference to a proposed suboceanic line to Miami—E.C.]

5 YEARS



Colonial is identified with the regular operation of the Air Mail, as Contract Air Mail Route 1, New York, Hartford, Boston—Foreign Air Mail Route 1, New York, Albany, Montreal—Contract Air Mail Route 20, Albany, Rochester, Buffalo, Cleveland—are all operated by Colonial Companies + Passenger Transport Lines, on regular schedules between New York City and Boston, New York and Montreal, and from Buffalo to Toronto are also a part of the Colonial System + Colonial Flying Schools are maintained in New York State and New England + From this well-rounded experience Colonial has selected the planes for which agencies are being offered.

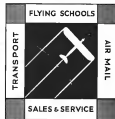
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THOUSANDS OF DOLLARS WILL BE BID
FOR OPPORTUNITIES SUCH AS THIS.

To a limited number of men of standing, possessing a reasonable amount of capital, Colonial Flying Service offers agencies in New York State and New England for the following planes:—Pitts, Fairchild, Challenger, Pitcairn, and Standard—Model 1. Price \$3,485 F.A.F.—Model 2. Price \$4,985 F.A.F. A recent commercial development of the Consolidated Training Plane used by the Army, Navy and Marine Corps. A splendid student instruction ship with dual control—powered with a Warner "Seawall" 110 H. P. or a Kinner 100 H. P. motor. CHALLENGER—Model KR 21A. Price \$4,685 F.A.F. A tapered wing two place plane for the private owner who wants a small, fast sport ship. Dual control—very maneuverable—powered with a Kinner 100 H.P. motor. CHALLENGER—Model KR 34A. Price \$6,575 F.A.F. An ideal three place open plane with dual control, suitable for cross country flying. Powered with a Wright 26-165 H.P. motor. Plenty of speed—brakes for ground control—economical to operate. PITCAIRN—Sport Mailplane. Price \$8,500 F.A.F. The last word in design refinement and sturdy construction. Especially built for Air Mail operation. A three place, open plane with dual control—powered with a Wright 25-225 H.P. motor. Very fast, 145 M.P.H. with N.A.C.A. cowling—brakes for ground control. FAIRCHILD—Model 71. Price \$18,900 F.A.F. A cabin plane accommodating a pilot and six passengers. Ideal for charter operation and for business concerns requiring air transportation. Powered with a Pratt & Whitney Wasp 425 H.P. motor. STANDARD—Model D-25. Price \$9,750. A five place open plane—designed for passenger hopping from all types of fields—exceptionally high load capacity—quick take-off and low landing speed. Removable dual control—powered with a Wright 25-225 H.P. motor—brakes for ground control. The market for the sale of planes divides itself into: 1. Training schools and student flyers, 2. Business organizations for commercial use, 3. Private owners for sport and personal transportation, and 4. Operators for charter service and passenger hopping. The range of planes for which Colonial offers franchises is varied as to price and type so as to meet all demands of the market. Colonial franchises cover the sale of ships and all equipment pertaining to their operation and maintenance. Affiliation with established flying fields can be arranged. A Colonial franchise offers an immediate opportunity for a small volume, profitable business. If you are interested in this business of aviation, write for territories available and conditions for securing a franchise.

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NEW YORK CITY



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Specifications

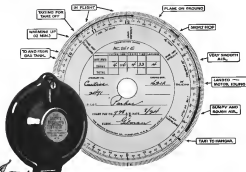


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THE SERVIS RECORDER is a small and very simple device which automatically makes travel and engine records on a chart 6 inches in diameter, such as the one shown. It gives you daily every movement of the plane in the air and on the ground. It is 7" in diameter, weighs 2 pounds, costs only \$32.50 and can be attached in a few moments time to any part of the engine or cabin. The SERVIS RECORDER is a completely self-contained unit operated by an elastic mechanism and by the side entry and rotation of the plane. It is not connected up with the motor in any way.

Each day a fresh chart is put in. At the end of the day the chart comes out bearing a complete and accurate story of the day's flight. In other words, the plane "tells" its own log. These charts are invaluable to log book records and for use by the accounting department.

The SERVIS RECORDER has been proved by many years of use as sound recording. Over 50,000 are now in daily service on motor tracks. The mechanism is sturdy and midget-proof and will give years of unimpaired service. The coupon below is for your convenience.

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These Reliable Batteries
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PILOTS of every sort of aircraft... from tiny pursuit planes to great air liners... have found that Exide Aircraft Batteries do their jobs faithfully, steadily, dependably under any conditions.

That's why Exides are the airman's choice. He knows from experience what they can do... he knows he can rely on them at all times.

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Visit the Exide Booth No. 141 at National Air Race and Exposition, Cleveland

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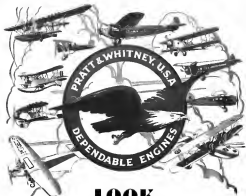
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The New BELLANCA *Pacemaker*

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Fast, strong and beautiful—built for those who can recognize aircraft excellence—the new Bellanca Pacemaker lays honest claim to the title "America's finest airplane." The Pacemaker is a standardized line-production plane representing all the exclusive principles of Bellanca design, with a refinement of detail and attention to present-day requirements, which once more places the Bellanca far ahead of its competitors.

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Be sure to see the Bellanca Pacemaker at the National Air Races at Cleveland. Bellanca Aircraft Corporation, New Castle, Delaware.

Performance Specifications: Service ceiling 8,500 ft. maximum. Range of 1,000 miles. Maximum speed, 140 m.p.h. Cruising speed, 115 m.p.h. Landing speed, 40 m.p.h. Climb rate, 1,000 ft. per min. Fuel and oil capacity, 170 lbs. The Bellanca C-200 remains in production as a seaplane at a high speed of 130 m.p.h. and cruising speed of 100 m.p.h., payload with pilot, 1,250 lbs.



The Bellanca Pacemaker (seaplane) shown with the Wright Whirlwind Nine equipped with all metal race floats



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President and

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No one ever asked more of spark plugs than did Dale Jackson and Forest O'Brine when they set the world's endurance record at 420 hrs., 20 min., 31 sec., in their B. G. equipped Challenger powered Curtiss-Robin plane.

During this grueling test B. G. Spark Plugs functioned 100 per cent.



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On dress parade

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But, meeting all weather conditions from biting sleet, scorching sun and driving rain, today's aircraft must have colors of stamina that stand the gulf-strafing rollers. They have to maintain their lustrous style and long distance visibility day in and day out.

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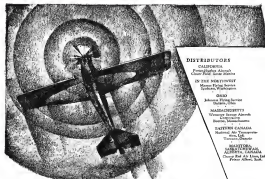
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RESPONSIBILITY

EACH new plane that takes the air is an added responsibility for the manufacturer . . . the consumer. Every manufacturer . . . the manufacturer who expects to stay in business and be a real power in the industry tomorrow as well as today. One of the first laws of the Buhl Aircraft Company is that responsibility starts — not ends — on delivery. A widespread dealer organization maintains constant supervision of all Buhl planes in operation. Factory service and cooperation is always prompt, courteous and efficient. Buhl has learned what responsibility means through the 56 years during which the name has been identified with

progressive industry in every field. Buhl planes today carry far more than the name alone—they preserve the precious heritage of almost a century of manufacturing leadership and integrity. That, too, is a responsibility which cannot be ignored. This sense of responsibility is preserved in all the relations of the Buhl Aircraft Co.—with its customers, with its sources of supply, with its competitors in the industry, and with the members of its own organization and its distributors. A Buhl franchise is a profitable franchise, because it is founded upon a sound basis. Write today for catalog or details of our attractive dealer plan.



BUHL Aircraft Company
MARSHVILLE, MICHIGAN



Built to Meet Demand for a Better Airplane

The principal reward of an aircraft builder's success in this time of keen competition is the satisfaction of having owners who testify with enthusiasm to the dependability of an airplane under all conditions. This reward has been enjoyed by Spartan ever since the present Spartan C-3 has been in production.

Spartan had a modest beginning in a modest factory building. Rapidly it became recognized that in Spartan were distinctive qualities of design, outstanding safety factors, superior construction principles, expert and finished

workmanship. And as a result grew the Spartan reputation for building better airplanes.

Now the Spartan factory covers two acres, Spartan factory employees number well over a hundred persons and Spartan representatives may be found in many of the principal cities of America.

Spartan Aircraft Company is confident that its policy of steady, regular production has firmly associated the name Spartan with the highest ideals of quality in aircraft, rather than in quantity produced.

SPARTAN AIRCRAFT COMPANY
TULSA, OKLAHOMA



"BIRD"



Why they suit the DEALER!



Safety in Training—Speed in Transportation DEPENDABILITY at all Times

THE MERE SELLING of a plane is NOT ENOUGH. Many times the sale depends upon instruction; often a sale is made to a newly qualified pilot. The dealer's problem is to sell the plane which will afford the quickest instruction and at the same time assure the new pilot of the highest degree of personal safety.

And again, to sell for transportation means the selling of speedy miles, ease of handling, and low cost of operation.

BIRD dealers are satisfied that these planes embrace the features of ALL THAT CAN BE DESIRED IN THE FINEST OF AIRCRAFT.

"MORE PERFORMANCE PER HORSEPOWER"



PLANES



Why they suit the FLYER!

1. Chrome molybdenum tubing throughout.
2. Inherent stability perfected to a degree which allows fool-proof student training.
3. Dual control with front seat quickly detachable for passenger carriage.
4. Perfection in alarm design.
5. Wing design perfected aerodynamically to a degree which permits performance comparable to clipped wings.
6. Landing gear of split axle type with combination shock and rubber shock absorbers.
7. Metal turtle deck from front to rear allowing internal inspection.

WHEN a BIRD pilot gives her the throttle he knows that he can **OUTSPEED** any other ship of the same horsepower.

When he hovers over a small field he knows that he can **LAND SAFELY**—and **GET AWAY** with EASE.

When he takes a passenger—whether for hire or as a guest—he knows that his passenger is afforded the **HIGHEST DEGREE OF SAFETY**.

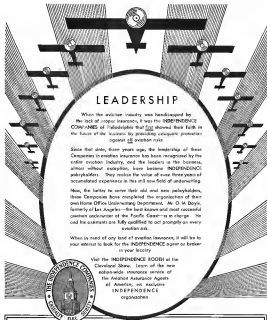
When he lands in a strange field he need not apologize for his plane, because he knows that he has just brought in the **GREATEST PERFORMER PER HORSEPOWER**.

Confidence and pride are manifested in the satisfaction with which the pilot regards his BIRD.

BRUNNER-WINKLE AIRCRAFT CORPORATION
17 Haverkamp St., Brooklyn, N. Y.







LEADERSHIP


When the aviation industry was handicapped by the lack of proper insurance, it was the **INDEPENDENCE COMPANIES** of Philadelphia that first showed their faith in the future of the business by providing adequate protection against all aviation risks.

Since that date, three years ago, the leadership of these Companies in aviation insurance has been recognized by the entire aviation industry, and the leaders in the business, almost without exception, have become **INDEPENDENCE** policyholders. They realize the value of over three years of accumulated experience in this still new field of underwriting.

Now, the better to serve their old and new policyholders, these Companies have completed the organization of their own Home Office Underwriting Department, Mr. G. M. Doyle, formerly of Los Angeles—the best known and most successful western underwriter of the Pacific Coast—is in charge. He and his assistants are fully qualified to act promptly on every aviation risk.

When in need of any kind of aviation insurance, it will be to your interest to look for the **INDEPENDENCE** sign or banner in your locality.

Visit the **INDEPENDENCE BOOTH** at the Cleveland Show, learn of the new nationwide insurance service of the Aviation Insurance Agents of America, an exclusive **INDEPENDENCE** organization.



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Independence Indemnity Company — Independence Fire Insurance Company
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THESE COMPANIES MAINTAIN CLOSE RELATIONS WITH THEIR AGENTS, BROKERS AND PRINCIPALITIES

Nation's finest airport demands fueling pit service!

A prominent aviation writer, after recently visiting the leading airports throughout the country, stated that the fueling facilities of the Oakland port are superior to any in America! Some of the nine Bowser fueling Pits installed at this port are shown in the photographs below.



Soon after the Oakland Municipal Airport was opened as a commercial field, all trucks were banned from the operations area in the interest of safety.

Mr. G. B. Heparth, Port Manager, has the following to say about his fueling equipment: "The pit fueling systems installed have won the favor of all pilots operating at the field and we believe that they have aided materially in winning for Oakland Municipal Airport the reputation of being one of the Nation's best managed airports."

Bowser Fueling Pits are made in various models to meet all fueling requirements.

BOWSER AIRCRAFT FUELING SYSTEMS

Bowser Fueling Systems have a service radius of fifty feet—any equipped with a light that enables owner/aircraft to be located at night—offer an ground level—no special tools needed—supply accurate records of all quantities dispensed, and are especially designed in supply gasoline from which trace of dirt, sediment or moisture has been removed.

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Viewpoint

AN AIRPORT today is considerably more than just a place for the arrival, departure and housing of airplanes.

The modern viewpoint necessitates individual study of each terminal, particularly to attain minimum investment, bearing in mind that today's requirements may be inadequate or obsolete a few years hence.

Our organization offers the respective viewpoints of pilot, engineer and city planner, co-ordinated for the proper solution of each airport problem.

A. D. C. co-ordinated service covers:

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ONE ORGANIZATION
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CONSULTANTS
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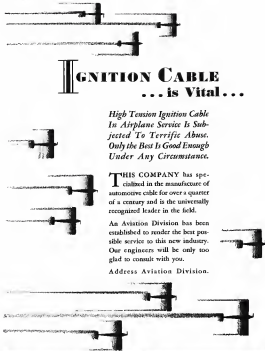
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THIS COMPANY has specialized in the manufacture of automotive cable for over a quarter of a century and is the universally recognized leader in the field.

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LARGEST EXCLUSIVE MANUFACTURERS OF AUTOMOTIVE CABLE IN THE WORLD



THE Moths on this world map indicate the number of machines known to be in every-day use over land and water throughout the world, either in military or naval air forces, on official government work, or for private or commercial flying. This universal choice is due to the brilliant performance of the Moth and its unparalleled

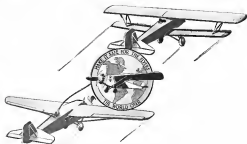
record of successes. Its reliability, economy, safety, and speed have been responsible for associating with the Moth the slogan, "The Best Light Airplane in the World."

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INCORPORATED IN THE STATE OF CALIFORNIA

LOWELL, MASS.

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Gipsy Moth**



REASONS WHY PRACTICALLY ALL AMERICAN AIRCRAFT ARE AERO SUPPLY EQUIPPED

First, because every leader in the industry knows the vital—life and death—importance of AERO SUPPLY quality in the hundreds of hidden parts of a plane—the bolts, nuts, ferrules, rivets, rivets, washers, screws, shackles, turnbuckles, levers, and many, many others—as well as in steel tubing, special steel, wires, cables and cable fittings.

Second, because every AERO SUPPLY product is made in strict accordance with U. S. Army and Navy standards and specifications—and tested and proved beyond Government requirements by the highest chemical, physical and metallurgical tests.

Third, because of the standardization of AERO SUPPLY material—and the uniformity to absolute precision in size, thread, cuttings and other important details.

Fourth, because all AERO SUPPLY products have proved their dependability under every conceivable condition of emergency stress and strain—in a half million flights.

Fifth, because, operating these modern efficient plants, ample stocks of AERO SUPPLY products are always available—and "supplies as ordered—promptly shipped"—in our inevitable, irrevocable role.

Lastly, because for all these reasons AERO SUPPLY products have never—in any particular, or in any instance—failed to live up to our slogan—"Make it safe for the flier—the world over!"

AERO SUPPLY MFG. CO., INC.
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National Steel Products Company, Dayton, Ohio

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The Racing
NB-3 Monoplane

Another WORLD'S RECORD

for Light Planes

again demonstrating the
Unequaled Stamina of the
LeBLOND '60'

From Brownsville, Texas to Winnipeg, Manitoba, a distance of 1650 miles in 16 hours is a new world's non-stop long distance record for light planes established by D. & "Harvey" Zimmerman in his LeBlond powered during NB-3 Monoplane.

Zimmerman took off from Brownsville at 2:45 A. M. with 190 gallons of gasoline and 6 gallons of oil. Zimmerman landed at Winnipeg at 6:45 P. M. having traveled 1650 miles, beating the previous light plane distance flight by 678 miles.

In this record breaking flight only 46 gallons of gas and 1½ gallons of oil were consumed.

Leaders everywhere are turning to the LeBlond "60." Its acknowledged sturdiness, foolproof assembly, and easy accessibility for replacements or repairs, combine to make it the peer of aircraft power plants within its scope of application, for student training, sport or commercial use. Write for descriptive folder.

THE LEBLOND AIRCRAFT ENGINE CORPORATION
CINCINNATI, OHIO, U. S. A.

THE LEBLOND "60" with which this new long-distance record for light airplanes was established is the first and only aircraft engine in its class to pass successfully the difficult United States Navy 30-hour test.



"Bacon" Zimmerman who achieved international prominence in establishing the world's distance record for light planes.



A.T.C.
No. 17
Approved
1938
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Announcing



SKY SPECIALTIES CORPORATION

manufacturers of the

HEYWOOD STARTER

See our book *Nix 1784* sold at the National Aeronautical Exposition at Cleveland, Ohio, Aug. 14 to Sept. 2.



Sky Specialties Corporation, which has just acquired the assets of the Haywood Starter Corporation, has on its directors some of the most prominent men in the Aeronautical and Motor Car industries in the country.

Arthur L. Cook, formerly President of Northway Nurses, is President of the Company, while on the Board are Chas. B. Babin, President of the Babin-Althausman & Brass Corporation, William B. Stout, President of Stout Air Services, Inc., and Edward F. Roberts, Vice-President of Production, Packard Motor Car Company.

It is intended to immediately increase production to ease for the ever-increasing demand, and with ample resources of man-power, manufacturing facilities, and finances, the new company is prepared to keep right in the face in the tremendous growth which this entire industry will experience in the next few years.

KEY SPECIALTIES CORPORATION
3401 East Avenue • Detroit, Michigan

At the Cleveland Show
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BENDIX

Airplane Wheels and Brakes

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BENDIX BRAKE COMPANY
SOUTH BEND, INDIANA
(Divisions of Bendix Automotive Corporation)



Announcing the Sperry AGA Floodlight

OWING to the demands of major Airports for a high powered floodlight that is **efficient** and **dependable**, the Sperry Company has designed and now has in production a 1000 millimeter, 180 degree, dioptric Floodlight with the Sperry Full Automatic Arc Lamp Mechanism. Incorporated in its design is the experience gained in nearly a decade of field lighting.

This powerful floodlight not only completely illuminates the field but makes the hazards around the field stand out as if by day.

Following are some of the outstanding features of this light.

Lens: Precision ground and polished, 1000 millimeter, 180 degrees dioptric lens manufactured by the American Gas Accumulator Company.

Housing: Constructed entirely of aluminum alloy and chromium plated brass. Two large doors permit easy access to the interior.

Ventilating System: Motor driven, exhaust type.

Lamp Mechanism: Sperry High Intensity Arc, Full Automatic Lamp, standard for U. S. Army, 60-inch Anti-Aircraft Searchlight. A single trim of carbon burns for two hours.

Control: Can be controlled locally or remotely as conditions require.

This powerful Floodlight has been adopted as standard by Curtiss Airports, Inc. See it in the Curtiss Booth at the Cleveland Aircraft Show.

Full particulars upon request.

Distributors: CURTISS FLYING SERVICE, Inc.

SPERRY GYROSCOPE CO., INC.

BROOKLYN
CLEVELAND PHILADELPHIA SEATTLE



NEW YORK
LOS ANGELES SAN FRANCISCO



The new Warner "Scarab" plant now in full operation is a model for the production of fine aircraft engines.

Completely equipped with the most modern and most efficient facilities — manned by specially trained and skilled aeronautical mechanics and engineers, the new Warner plant represents the finistry in painstaking manufacturing procedure.

We believe it is fitting that the ideal light power plant should be made in the ideal factory.

610 H.P. 1875 R.P.M.
Weight 275 lbs.

WARNER "Scarab" ENGINES

WARNER AIRCRAFT CORPORATION • DETROIT, MICHIGAN

The WARNER "Scarab"

Consistently performing in all parts of America, the 110 H.P. Warner "Scarab" continues its leadership as the outstanding light power plant of the industry.

This engine is invariably chosen because of its unvarying performance characteristics. For dependability, endurance and economy, the Warner "Scarab" is in a class by itself.

Send for complete literature. Specify Warner "Scarab" if you want the last word in a light, high quality design.



110 H.P. 1300 R.P.M.
Weight 275 lbs.

WARNER "Scarab" ENGINES

WARNER AIRCRAFT CORPORATION • • DETROIT, MICHIGAN

AVIATION
August 24, 1935

77



Aerial aspect of Boeing System at Los Angeles. Layout, design and construction by Austin.

Airport Engineering Experience

THE United Airport of the Boeing System at Los Angeles, now under construction, is a typical example of Austin complete airport service. This organization is handling the layout, design and construction of the complete project.

Previous contracts with Boeing have included several large plant additions at Seattle, as well as hangars and airport work at various sites.

Another recent project at Los Angeles which was designed and built by Austin, is a combination factory and

hangar for Morland Aircraft Company.

A dangle dock for the Goodyear Zeppelin Corporation has just been completed by Austin in Massachusetts, in the record time of 90 working days.

These and other aviation projects in 40 cities from Coast to Coast indicate the breadth of this company's experience in a field where wide experience is rare.

For information on any type of airport or aviation building project, phone the nearest Austin office, wire or send the Memo.

Visit the Austin Booth at the Cleveland Show,
No. 81-82, in the center of the Annex.

THE AUSTIN COMPANY



Airport Engineers and Builders • Cleveland

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THE OUTSTANDING SPORT AND

THE SAFEST LIGHT PLANE *that ever zoomed through the blue*

EACH vital point of the Avian's structure will support a load eight times as great as it will be called on to carry in normal flight.

Safety is the keystone of Avian design. It has safety in its strength . . . safety in its Handley-Page slotted wings . . . safety in its dependable Cirrus 95 H. P. air-cooled motor . . . safety in its amazing ease of control . . . safety in its wide, split-axis shock-absorbing undercarriage . . . safety in its slow landing speed of 35 m. p. h. . . and safety in its entire record-breaking history.

The same efficient features that make it safe also make it sporty. With the utmost confidence, you can put the Avian through its paces, feeling that it will always do what you ask it to do.

The Avian costs less to operate than the average size automobile. It gives 20 miles to a gallon of gas, and 500 miles to a gallon of oil.

The wings fold so that the plane is only 9½ feet wide. The weight is only 875 pounds. Top weight, 1600 pounds. The price is \$4995, flyaway, or f. o. b. Bridgeport, Conn. Time payments arranged. Whether you intend to buy a plane for personal or commercial use, or are operating a training school, or are interested in taking a Whitteley Avian franchise for your territory, write today for complete information to Whitteley Manufacturing Company, Dept. H-5, General Office and Plant, Bridgeport, Conn.



For SAFETY—the Handley Page wing slot



WHITTELEY AVIAN

TRAINING PLANE OF THE WORLD



Approved Type Certificate
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performance beyond horse power-

The Horse Power of the Barling NB3 gives no indication of its real performance. Only the performance itself tells the story. The NB3 has broken the World Light Plane Record for a Non-Stop Distance Flight—sweeping 1550 miles from Brownsville, Texas to Winnipeg, Canada in 16 hours—595 miles an hour! It holds the American Airspeed Record for Light Planes—20,624 feet! And, unlike most light planes, the Barling NB3 is endowed with inherent stability. Smoothness and Non-Spin features are engineered into the plane—ensuring safety with-

out any doubtful mechanical appliances.

The Barling NB3 is the only plane with a 40 Horse Power engine designed to carry three people—the only all-steel, rammed 3-place airplane available in the United States—and the cheapest 3-place plane in the world to operate!

Our new 3-place Planes are a fact. Delivery becomes an established—our quick delivery problem is solved. Extra factory assistance is included in an exclusive feature! Write for our profitable Dealer Plan. NICHOLAS BEAZLEY AIRPLANE CO., Inc., Manufacturing Division, 111 Marshall, Memphis

BARLING NB3

Monoplane

World's Fastest Commercial Airplane USES GOODRICH SPLIT-SECOND SILVERTOWN TIRES

"TO FLY a Lockheed is more than to fly the world's fastest commercial plane," says an advertisement of the Lockheed Aircraft Company of Los Angeles, California.

"It is to fly with a new feeling of confidence . . . safety, strength, speed."

Safety, strength, speed! Confidence inspiring qualities in any plane. And



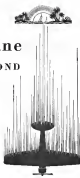
"Down to Earth" Boeing lands its new record from Los Angeles to New York and back again in the Split-Second Silvertown equipped Lockheed-Vega.



Three Goodrich Silvertown airplane tires—Paul West—New York—South Coast

these qualities are regarded as necessary qualifications for airplane tires by the makers of the world's fastest commercial airplanes.

Goodrich Split-Second Silvertowns used on standard equipment on Lockheed planes are of strong, stretch-mounted cord and the best of our safety-boosted by the famous Goodrich "water cure" process. They are strong enough to withstand the stress and strain of overlong take-offs, yet light enough to permit carrying three extra gallons of gas.



Flag to Flag with Aviation

GOODRICH has studied out its field in aviation. The miles of leaves they scatter in its race of endurance. Every Goodrich tire is improved—Bore-Gummed has well known superior history. And every Goodrich tire comes with the leader.

The B. F. Goodrich Rubber Company, Inc. 1215 Main Street, Akron, Ohio. Rubber Company, Inc., Los Angeles, Calif. Goodrich Corporation, London, England.

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CONTROL OF THE Conquering Forces of the Air BY VOLTAGE REGULATION

Voltage regulation is essential to safety in flying. Lights and radio are solving the problems of darkness and thick weather.

LEECE-NEVILLE SINGLE VOLTAGE and TWO VOLTAGE GENERATORS

are proving eminently satisfactory in furnishing all electrical energy requirements for modern planes.

Manufactured in varying capacities and designed for standard engine mountings.

These voltage regulated generators provide a reliable method of automatically insuring adequate battery charging by means of the tapering charging rate without danger of overcharging. They protect all connected apparatus from dangers of over voltage.

First successful two-voltage engine driven generators for single and two-way communication.

~* SERVICE TESTED ~*

THE LEECE-NEVILLE COMPANY
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(Manufacturers of Aircraft Electrical Generators Since 1920)



The "St. Louis Robin" was equipped with a STANDARD STEEL PROPELLER

That was the "business end" of the plane that completed this epoch-making flight—a flight terminated "by request," not by any failure of any part of the plane equipment. Engine and propeller were still functioning perfectly when the flight ended.

Increased Speed... Higher Efficiency... Greater Durability... Heat and Moisture Resisting Qualities... these are the proved factors which have made Standard Steel Propellers standard equipment on American Commercial and Military planes.

Standard Steel All Metal Propellers—first developed in 1919—may be obtained for engines rated at twenty to six hundred horsepower.

*This identical Propeller will be
exhibited in our Booth at*

THE CLEVELAND
AERONAUTICAL EXPOSITION

STANDARD STEEL PROPELLER COMPANY
General Offices and Works: West Homestead, Pa.



✓
FACTS
Regarding the
"St. Louis Robin"
Endurance
Flight

Left St. Louis July 13 at 7:47 a. m. Command Standard Time, London, St. Louis Daily.

Terminated July 30 at 7:30 p. m.

Elapsed time 425 hours 21 minutes, 36 seconds.

Estimated flight, 25,000 miles.

Refueling stops made 17 ports, 16 of which were for transfer of gasoline. Used 2,890 gals. gasoline and 124 gals. oil. Flies over Jackson and Forest O. Zone.

Best average endurance flight record broken by change of 179 hrs. 21 mins.

DAYTON BEAR [Four-in-Line]

Air-Cooled
Super Performance
Low Upkeep

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Rating . . .**

**110 Horsepower at 1550
revolutions per minute**

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Immediate deliveries



**The Dayton Airplane
Engine Company**

DAYTON, OHIO

THE LIFE PRESERVER OF THE AIR

(25,000 "Happy Landings")



Speed Holman*, member of the Lafayette Club and former holder of the air endurance record, has captured the part the Irvin plays in aviation.



The IRVIN Air Chute Gives Added Strength to the Strongest Wings

"Many of the giant strides forward in flying progress would not have been accomplished without the aid of the Irvin Air Chute. The mechanical perfection and imperfections of all sorts of flying craft were tested to the utmost without fear of life. The increased confidence of pilots and the consequent increased skill of practical flying served to bring out more plainly than ever the strong features and weaker points to associate. The past progress and present safety of aviation owe much to the fine construction of the Irvin Chute."

On more than 25,000 occasions, "free" test and emergency jumps with the Irvin Air Chute have proven infallibly successful. Adopted by all the air forces of the United States and by 20 other governments it now assures safety to flyers all over the world.

Infinite care and finest materials go into the manufacture of Irvin Air Chutes. Thorough inspection of even the smallest detail and careful packing insure the perfect functioning of the Irvin Chute whenever called upon.

Irvin Air Chutes are available in all sections of the country. Among the important distribu-

tors are Curtis Flying Service, Inc., The National Flying Schools, Air Associates, Inc., and Nicholas-Brosley, Airplane Co. Dealers who are interested should communicate directly with the company.

If there are no dealers near you, write to us and we will arrange the most convenient way to supply your needs.



The Irvin Air Chute is available in many, far greater sizes. They are well designed to be correctly used in situations that are greater in size and are used as well as the other in 1939. They have been tested and proven successful with the standard U. S. Government parachute regulations.

IRVIN
Air Chute

*The Lafayette Club, organized in 1924, is devoted to maintaining a team who have used this device to complete jumps from their plane in conditions. The club is the only one in the world that has done this jump with Irvin Air Chutes.

IRVING AIR CHUTE CO., Inc.
Buffalo, N. Y., U. S. A.

Factories in Buffalo, N. Y. and London, England

On these pages "Happy Landings" as awarded while free floating aerial operation of the chute, are those in suitable form of design in schools, clubs and organizations interested in aviation. Send for further and particulars.





LOOK into the HIDDEN VALUES

in every plane equipped with

HASKELITE

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Co., Ltd., Toronto, Montreal,
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See HASKELITE in the booth of any leading aircraft manufacturer at the Cleveland Exhibition, or visit us in Booth No. 300, or our headquarters at the Hollenden Hotel

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AD-24049



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HANGARS

MODERN—DAYLIGHT—FIREPROOF—CLEAR
FLOOR SPACE—FULL WIDTH STEEL DOORS

Every desirable feature in the efficient housing of airplanes is embodied in Truscon Hangars. The walls are an expanse of glass, giving daylight to every part of the interior. Thorough fire protection is provided by the use of Steel Windows, Steel Doors and Insulated Steeldeck Roofs. The floor is entirely free of columns, permitting the easy handling of planes. The Steel Doors open the full width of the hangar so that airplanes enter and leave without interference. Repair shops are located in the side bays for maximum convenience.

Truscon furnishes you either the complete building from standardized plans or the Steel Doors, Steel Windows and Steeldeck Roofs adapted to your own design. Write us your requirements so we can offer suggestions without obligation to you.

TRUSCON STEEL COMPANY, YOUNGSTOWN, OHIO
AERONAUTICAL DIVISION

Truscon Company Steel Company of Canada, Limited, Winnipeg, Ont., Man.
Representative Offices in Toronto, Ottawa, Montreal and the United States of America.

TRUSCON HANGARS AND HANGAR DOORS



Anchor Low Flying Area Boundary Fence at Roosevelt Field, Garden City, L. I., N. Y.

ENFORCE SAFETY ON THE GROUND

Reduce insurance costs with..

Anchor Fences



Anchor Enclosure at Municipal Airport, Peoria, Ill.



Anchor Enclosure at Alameda Airport, Alameda, Calif.



Special Anchor Gate for Ranger One

STRENGTH regulation and supervision is enforced at every airport to prevent accidents "in the air." On the ground, too, airport operators are rapidly taking steps to reduce safety.

Already, many airports have provided properly located fence barriers to keep motorists off the flying area of the field . . . to control auto traffic . . . to protect airport property. At these enclosed fields the risk of injury to visitors and flyers is minimized . . . insurance costs are reduced.

The number of prominent airports which have selected the Anchor Post Fence Co. to supply fence barriers indicates the superiority of Anchor Fencing Service. To the airport operator contemplating barrier protection these definite advantages will appeal:

1. A wide experience in airport fencing
 2. The low exclusive Anchor features of construction.
 3. The benefit of 35 years experience in manufacturing and erecting fences of all kinds
 4. A nation-wide organization with Fencing Specialists and trained erection crews located in 75 principal cities
- Factories in Baltimore, Cleveland, San Francisco.

Get in touch with our nearest District Office for complete information or a consultation with an Anchor Fencing Specialist.

Anchor Protected Airports

Roosevelt Field, Garden City, L. I., N. Y.
Municipal Airport, Peoria, Ill.
Willes Field, Boston, Mass.
Baltimore Airport, Baltimore, Md.
Paris Airport, St. Louis, Mo.
Howard Airport, Newark, N. J.
Alameda Airport, Alameda, Calif.

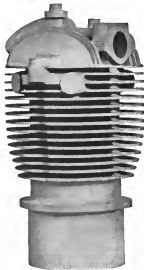
ANCHOR POST FENCE COMPANY

Baltimore, Md. & East St., Baltimore, Md.
Atlanta, Ga. (Chickasaw, Okla.)
Chicago, Ill. (Cleveland, Ohio)
Cleveland, Ohio (Cleveland, Ohio)
Detroit, Mich. (Detroit, Mich.)
Houston, Tex. (Houston, Tex.)
Los Angeles, Calif. (Los Angeles, Calif.)
New York, N. Y. (New York, N. Y.)
Philadelphia, Pa. (Philadelphia, Pa.)
Pittsburgh, Pa. (Pittsburgh, Pa.)
Portland, Me. (Portland, Me.)
San Francisco, Calif. (San Francisco, Calif.)
Seattle, Wash. (Seattle, Wash.)
St. Louis, Mo. (St. Louis, Mo.)
Tampa, Fla. (Tampa, Fla.)
Washington, D. C. (Washington, D. C.)
Wichita, Kan. (Wichita, Kan.)



Users of Cheney Cast Cylinders

Aeromarine Corporation of America
Brownback Motor Laboratories
Crosley Radio Corporation
Century Rotary Motor Corp.
H. H. Franklin Manufacturing Company
Hurricane Motor Company
Wright Aeronautical Corporation



Cheney Cast Cylinder for the Brownback Motor Model C-404

AN investigation of the possibilities of Cheney Cast Cylinders as applied to your motors may surprise you. The nickel-iron used has shown remarkable features in wear-resistance and weight and the twenty-five years' experience in the casting of intricate design has enabled us to render a most constructive service to motor manufacturers.

Send us your blue prints and specifications, they shall have our immediate attention.

Scheney and Son
MANULS, N.Y.



do flying men have such confidence in HAMILTON PROPELLERS

WHEREVER you go . . . wherever men fly . . . wherever pilots choose their ships for fine performance, you will find Hamilton Propellers. Why such confidence? The answer is simple. It is because they know that "wasp" is in the engine and the plane . . . because they know that Hamilton Propellers are fitted scientifically to give the greatest efficiency . . . because they know that the Hamilton trademark is the stamp of the highest quality and accuracy . . . because they know that Hamilton is one of the greatest names in American aviation.

and that Hamilton Propellers have for many years maintained a leadership that has never been approached.

That is why flying men have such confidence in Hamilton Propellers . . . and why Hamilton Propellers figure in so many speeded and record-breaking flights.

Hamilton Propellers are made of wood and metal . . . A design for every combination of ship and engine . . . especially fitted to match speed tests . . . tested . . . especially balanced . . . and strong . . . like the Hamilton design at the Cleveland Air Races. A complete exhibit of propellers.

HAMILTON PROPELLERS

HAMILTON AERO MANUFACTURING COMPANY

Division of United Aircraft and Transport Corp.

1405 Bryn Mawr Street

Wilmington, Wla.



The United States Airways, Inc. use Allmetal Flamingo Transports in daily express and passenger service between Kansas City and Denver

3¢ a passenger mile

7 passengers plus 500 lbs. mail or express. Cruising speed 125 m.p.h. with "Hornet" or "Cyclone," 115 m.p.h. with "Wasp." Write for detailed operating cost.

Demonstration ship will be sent to any part of the United States

ALLMETAL FLAMINGO

Metal Aircraft Corporation of Cincinnati

an Air-minded discussion of FABRICS



Cabin of the Curtiss "Condor," showing the interesting use of Schumacher Fabrics.

SMART FABRICS play no small part in the beauty of the luxurious cabin planes that soar the skies today. Involving decorating is as important in finishing them as in furnishing a home or apartment.

The Curtiss "Condor" Transport illustrated shows a novel and decidedly interesting use of Schumacher Fabrics. The walls are decorated with a rough texture wool drapery in useful tones of brown and dark and light shades of brown. The modern design worked out in a fully blended rectangular form is just the twentieth century note desirable in a plane.

The ceiling is covered with a Schumacher silk and wool rug. An interesting feature in the use of the wrong side of the material which shows the tea wood calicoed by them, showing threads of brown silk.

In the Schumacher collection you will find a wide selection of distinguished fabrics exceptionally desirable for airplane interiors. Modernistic designs, Rother designs, rope, denims, moiré and a wealth of weaves and patterns created by prominent designers.

F. Schumacher & Co., Dept. V-8, 66 West 40th Street, New York, Importers, Manufacturers and Distributors in the trade only. Offices also in Boston, Chicago, Philadelphia, Los Angeles, San Francisco, Grand Rapids and Detroit.



The interesting wool drapery used to decorate the walls of the plane shows the wrong side of the material.



Follow wings and show your buying skill in the invisible beauty of this "Condor" plane.

F·SCHUMACHER·&·CO



STINSON DETROITER . . . and . . . SOLOTEX QUALITY above everything

You may try a fabric for any one of many reasons—but you will continue to use it for its quality.

And when along with consistent quality, you get that essential which business men call "Service," you are getting everything—no mill can give you more.

One rule governs the Solotex system—

QUALITY above everything
SOLOTEX
fabric

SELLING AGENTS

Solotex Department
Whitney Mills
40 World Bldg., N. Y. City

J. E. Blough Co.
4618 Kentucky Ave.
Chicago, Ill.

Western Aviation Supply Co.
Manassas, Va.
Oakland, Calif.

DISTRIBUTORS

Air Associates, Inc.
Curtis Field Division
Garden City, N. Y.

Air Associates, Inc.
5108 West 41st St.
Chicago, Ill.

Look for the red and blue selvedge threads



THE following is
one of the many letters duly
received by Porter-Cable
Sanders and Gundersen:

Fokker
COMMAND-AIRCRAFT



"19 of them save
considerable money for us"

... Says FOKKER

THAT'S what Mr. May-Superintendent of the above Fokker
Plant at Pomona, N. J., reports of their 18 Syracuse SP-10
Sanders and Gundersen.

Illustrated above 4 Syracuse Sanders finishing wood parts to be
blasted in tempo.

The range of utility in the fast of machines keeps them steadily
engaged in doing work—blasting or grinding wood or metal parts
—as required. Easily portable and operating on any power source,
Syracuse Sanders are kept practically busy in both wood and metal
departments.

Accuracy in sanding work is provided by use of single gangs and
adjustable tables. A vacuum system conserves dust and noise.

The TAKE-ABOUT Sanders likewise transcendently extra production
in fast and even considerable money on fast and long hauls—
as fast as any sanding unit is when it is more portable to take the
machine to the work. Plans and engine models report 30 to 75
cents with the TAKE-ABOUT because it works smooth, almost
silent, is better than by hand.

Syracuse Sanders and Gundersen and TAKE-ABOUT Sanders are
operating and improving production in many busy plants as this
month as the plant at the left. To see what these machines could do
on your plant send for information detailing the complete line of
Syracuse Sanders and Gundersen—over 15 and 9 in. hole and specific
—also the TAKE-ABOUT— and Sanders used in larger repair shops.

THE PORTER-CABLE MACHINE CO.
Lock and Wolf Streets, Syracuse, N. Y.

PORTER-CABLE
SANDERS

©1929



In the BUTLER BLACKHAWK

**SPEED...
STABILITY and LIFT
are Balanced to a
Rare Degree**

It is capable of meeting many of
the performance needs of a
"business" aircraft plane that
hold the answer to this question.

Greater landing power with
low overhead engine speed,
stability and lift.

Waverly M. Emerson, designer,
has engineered a pure business
airplane that meets the needs of
business men the world over.
The Butler Blackhawk, while main-
taining a landing speed of 31
M.P.H.

With its slow landing, high
top and cruising speeds, high
climbing power, quick take off,
rapid climb, useful load ca-
pacity and controllability—the
Butler Blackhawk is fully de-
veloped for profitable operation
by long distance flying or short
"hops", in the mail, express, pas-
senger or touring service. Its

strong characteristics combine with
the grace of pilot, business as-
surance or sportsman.

The Blackhawk is manufac-
tured under approved type cer-
tificates No. 154 L. & Dept. of
Commerce, Wright Whiskey
(J-6 Series) is the power unit.

About August 15, 1929, new
plant facilities in the Kansas City
Airport will greatly increase
production.

Additional facilities of ex-
cellent character will be in-
stalled. L. A. Wilson M. Emerson,
Sales Manager, is now arranging
with the various aviation dis-
tributors for the sale of the



BUTLER AIRCRAFT CORPORATION
Kansas City, Missouri



The Pontiac Municipal Airport



DCBH Rotating Beacon Mounted on Tower

Type DCBH
Rot Lighting ApplianceWind Vane Lighting
Fixture

THE Pontiac Municipal Airport is one of the best lighted airports in the country, in fact it was the first to make application to the Department of Commerce for an ALA rating. The selection of the lighting equipment was made only after an extensive study of all types and kinds on the market. When the final decision was reached Crouse-Hinds Company was called upon to supply the landing field floodlights, the revolving beacons, the boundary and obstacle lights, the larger roof floodlights, the wind sock lighting fixture, the rotating projector and coding height indicator, and the floodlights for illuminating the concrete apron in front of the hangar.

Two banks of six Crouse-Hinds Type DCBH floodlights produce an even distribution of light over the entire landing field.



Hangar showing MSA Floodlights installed on Roof

Everything in lighting equipment for airports and airways



Cables - Conduits - Pipes and
Ropes - Floodlights - Traffic Signals
Airport and Airway Lighting Equipment
Paralights and Cabinets - Switches

CROUSE

CH-AM

A Crouse-Hinds Installation

Type VAP
Obstacle LightType MSA
Large Roof Floodlight

Type DCBH Landing Field Floodlight



Coding Height Indicator



Type DCBH Coding Projector



A Bank of DCBH Landing Field Floodlights

which allows safe landings to be made at night. Type VAP obstacle lights are installed where it has been found advisable to warn pilots of dangerous obstructions near the field. Four Type MSA floodlights light the roof of the hangar and give the pilot additional perspective. In order that the landing of mail, passengers and planes may be done more easily, two Type LC216 floodlights have been installed to light the concrete apron in front of the hangar. The height of the coding may be determined quickly and easily with a Type DCBH coding projector which has been installed along with a Crouse-Hinds coding height indicator. With this equipment the computing of the height of the clouds is a simple matter.

Crouse-Hinds Company will furnish recommendations for lighting any airport upon receipt of detailed plans.

Complete information will be furnished upon request

-HINDS

NEW YORK
PHILADELPHIA
ST. LOUIS
CHICAGO

SACRED OFFICE

BOSTON

DETROIT

MILWAUKEE

CHICAGO

ST. LOUIS

PITTSBURGH

ATLANTA

SAN FRANCISCO



DETROIT AIRCRAFT

STATEMENT OF POLICY

THE BOARD OF DIRECTORS of the Detroit Aircraft Corporation includes men long and prominently identified with the rise of the automobile industry—and with the development of aviation. They are pledged to apply to the designing, building and marketing of aircraft the same efficiency in engineering, production, sales and service which has made the automobile business the world's leading industry. Their objective is to open the skyways to an ever-increasing number of air travelers through the economical development of improved aircraft of all types.

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DIVISIONS

LOCKHEED AIRCRAFT COMPANY,

LOS ANGELES, CALIFORNIA

Builders of the transcontinental record-

holding Lockheed

RYAN AIRCRAFT CORPORATION,

ST. LOUIS, MISSOURI

Builders of Speedsters in the "Speed of St. Louis"

AIRCRAFT DEVELOPMENT CORPORATION,

DETROIT, MICHIGAN

Builders of the all-metal Douglas DMCS

for the United States Navy

BLACKBURN AIRCRAFT CORPORATION,

DETROIT, MICHIGAN

EASTMAN AIRCRAFT CORPORATION,

DETROIT, MICHIGAN

Builders of Four-Passenger Flying Boats

MARINE AIRCRAFT CORPORATION,

DETROIT, MICHIGAN

THE WINTON AVIATION ENGINE CO.,

CLEVELAND, OHIO

GROSSE ILE AIRPORT, INC.,

DETROIT, MICHIGAN

AVIATION TOOL COMPANY, INC.,

DETROIT, MICHIGAN

Executive Offices: 1300 Union Trust Building, Detroit, Michigan

CORPORATION



The Detroit Aircraft Corporation is subdividing areas of its work at the Cleveland Aircraft Engineering Building, Aug. 24th—Sept. 2nd.

LOCKHEED
The Lockheed Vega plane for Test, with Power of 1000 hp and H. F. Wainwright

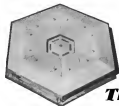


EASTMAN
The Eastman Four-Passenger Flying Boat, with 250 H. P. Curtiss Challenger Motor



RYAN
The new Ryan Speedster for 250, with the new Wright J-6 250 H. P. Whirlwind Engine

See these ships at the Cleveland Show on weeks the Detroit Aircraft Corporation, 1300 Union Trust Building, Detroit, Michigan Engineering Building.



The HEXHANGER **Has These Advantages**

Embodying entirely new and basic principles of design, the Hexhanger brings to Airplane Transport lines and Airports new facilities for the storage, servicing and repairing of airplanes that materially reduces operating expenses, lowers overhead and reduces capital investment.

It is built entirely of steel and concrete and is hexagonal in shape. With full width doors in each of the six sides, the Hexhanger offers immediate accessibility to all planes within the building and permits the fire-safe storage of 25% more airplanes than in conventional hangars of equal area.

Our architectural and engineering services are available to responsible organizations for the design and construction of complete modern airports. Write for full information.

The WM. EAVES CO.
1524 Labaig St., Los Angeles, California



HEXHANGER

Pat. Applied For

INTERIOR OF WESTERN AIR EXPRESS HEXHANGER



At a moment of refueling

FORREST O'BRIEN and DALE JACKSON
flying The Curtiss Robertson Monoplane

"ST. LOUIS ROBIN"

establish a new World's Endurance Record for standard flight, remaining constantly in the air for

420 Hours and 21½ minutes (over 2 weeks)

powered with Curtiss Challenger Motor
and lubricated with

GULFPRIDE OIL 120

This is a wonderful accomplishment for the biplane plane, proves the excellent reliability of both plane and motor and the perfect lubrication secured with GULFPRIDE OIL.

The Curtiss Robertson Airplane Mfg. Co. desired the best oil obtainable for this flight and sent us their order for GULFPRIDE OIL 120.

The oil was shipped to them promptly via express from our warehouse stock.

The same grade of GULFPRIDE OIL has been used in establishing other world's records for flying power, altitude and speed and is available to all pilots. Ask for it at airports.

GULFPRIDE OIL 75 for automobile

engines for sale at Gulf Dealers and all Gulf Service Stations.

Other grades GULFPRIDE OILS for aircraft, motor boats, outboard motors and Diesel engines.

GULF REFINING COMPANY, Pittsburgh, Pa., U. S. A.

REGIONAL SALES OFFICES: Boston, New York, Philadelphia, Chicago, San Francisco, Houston, Los Angeles, Portland, Seattle, St. Louis, San Diego, San Antonio, Texas.

THE WINGS of ACHIEVEMENT GLIDDAIR

**You are invited
to visit the main
Glidden Plant during
the National Air Races**

ALL the air lanes of the nation will lead to Cleveland during the National Air Races and Aeronautical Exposition, August 24th to September 2nd. The wings of achievement will glisten in the sky as the bird-men form this impressive pageant of the air.

Back of the men is the machine, and back of the machine are the component industrial products, among them Gliddair Finishes, a contributing factor to aviation progress since the early days of flying.

GLIDDAIR FINISHES are:

Gliddair Aircraft Sprays (Mitsubishi)
Gliddair Aircraft Lacquers—Aircraft
Gliddair Aircraft Enamels—Aircraft
Gliddair Aircraft Varnishes—Aircraft
Gliddair Aircraft Finishes—Aircraft
Gliddair Aircraft Paints—Aircraft

Gliddair Aircraft Finishes—Aircraft
Gliddair Aircraft Enamels—Aircraft
Gliddair Aircraft Varnishes—Aircraft
Gliddair Aircraft Lacquers—Aircraft
Gliddair Aircraft Sprays (Mitsubishi)

Gliddair Aircraft Finishes—Aircraft
Gliddair Aircraft Enamels—Aircraft
Gliddair Aircraft Varnishes—Aircraft
Gliddair Aircraft Lacquers—Aircraft
Gliddair Aircraft Sprays (Mitsubishi)

On the road to the Cleveland Airport—The main plant of the Glidden Company is on one of the principal thoroughfares leading to the Cleveland Airport. During your visit to Cleveland you are cordially invited to see how Gliddair Finishes are made.

GLIDDEN
EXPERIENCE IN EVOLUTION
FINISHES—PAINTS—LACQUERS—ENAMELS

**THE GLIDDEN
COMPANY**

National Headquarters
Glidden Ave., at E. 12th St., Cleveland, Ohio



To be good—is not enough AMERICAN EAGLES must excel

YOUR first ride in an American Eagle—over 250,000 times at the stadium—your first acquaintance with other planes—these are the times when you will realize the value, the beauty, the dependability and dependability that goes into every American Eagle. American Eagles are better built airplanes, made with the realization of the obligation American Eagle owes each purchaser. They look a better, American Eagle color has increased already. There's nothing more to be said about the American Eagle. It's complete. A wide range of planes with an American Eagle problem within the scope of almost everyone. There's just one way to know an American Eagle is on its way—CONGRATULATE it with other planes. You'll know then why it stands for everything that is best in the aviation industry. For your nearest American Eagle dealer or write us for literature.



The American Eagle Model 10 Phantom, powered with Wright Whirlwind 5-165 H. P. Motor (Power 50,700); the Wright 5-220 H. P. Motor (Power 57,000); the "A" 100 H. P. Engine (Power 10,000), or the "B" 100 H. P. Engine (Power 10,000). All planes flying today.



The American Eagle biplane shown powered with the Wright 5-220 Motor. A remarkable ship, proof at 10,000, flying today.



The Walker Thrush, manufactured by the Walker Aircraft Co., Inc., a division of the American Eagle Aircraft Corp., powered with Wright 5-220 Motor. Price \$2,750, flying today.

American Eagle aircraft and progressive buyers know at their command a complete service organization, placed at various points to serve the entire territory. You may also take advantage of the convenient time payment plan, devised for your convenience. Write the American Eagle Aircraft Corporation, Dept. A-10, Fairport, Kansas City, Kansas, for full details.

Valuable literature sent you upon request for well qualified distributors and dealers. Write or wire today for full information.

See these American Eagle Models at the Cleveland Aeronautical Exposition and National Air Races, August 24—September 2.



ESLINE HANGARS

the Choice of Modern Airports



Esline Steel Hangar of Vernon Airways, Inc., Newport, Vt.



Esline Airways, Inc., Erie, Ohio

VIEWS OF
RECENT
ESLINE
ERECTOR



Midwest Airways Co., Omaha, Neb.

ESLINE ADVANTAGES

1. Low Maintenance Cost.
2. Absolutely Safe.
3. Absolute Appearance.
4. Fire and lightning proof.
5. Ready operation—no time loss.
6. Single in line.
7. Expanded capacity—no alterations, dismantled or moved.
8. 100% Interior Value.
9. Best for building, loaded and not.
10. Easy Repair.
11. Removable Floor—Best Value.
12. Removable Foundation.

If experience counts—ESLINE should be YOUR CHOICE. 26 years of steel building experience coupled with a thorough understanding of airport requirements makes Esline the best—a Hangar which will satisfactorily fulfill every need at minimum cost. Scores of owners will be pleased to testify as to the many advantages of their Esline Steel Hangar. Our airport engineering division will be pleased to furnish you with complete information and data. You leave nothing to guesswork when you buy an Esline.

*Attractive Dealers Presentation Open in
You for First Hangar in Your Territory*

ESLINE COMPANY

OCONOMOWOC, Dept. A. WISCONSIN

Use
this
Convenient
Coupon!

Dept. A

Please send literature and information on Hangar 100—

Name _____

Address _____



See the Swallow T-P At the Cleveland Show

in the air—or at
the Public Auditorium

Aug. 24 — Sept. 2



Ruth Elder and the 24-passenger Swallow with which she shows to enter the Women's National Air Derby.

"Follow the Swallow"

See why Swallow deserves such popularity. See why student pilots learn faster and easier in this ideal training ship. Watch it perform daily at the field. You'll be convinced of its high safety factor. And—the price? Well that will amaze you as well as its economical operation.

THE SWALLOW AIRPLANE CO.

WICHITA, KANSAS

This is one of a series of advertisements devoted exclusively to advertising men in an effort to make general consumer advertising more profitable to buyer and seller. It is printed in these pages as an indication to readers that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial quality.



"They say"

buzz, buzz, buzz, buzz, buzz!

WHAT "they say" can make or break a business. That is determinable "they" can be the most invidious force or the most helpful. In the case of Manufacturer Green "they" worked both ways.

Green* makes a high quality product that is sold through electrical stores. In sales volume he succeeded in maintaining first place for a number of years. He consistently advertised to build consumer acceptance.

Two years ago several things happened. Green lost leadership to a compensor. Earnings decreased. Stock collapsed. His dealer list dwindled . . . all of which started the invidious "they" whispering, pointing, scolding.

Something had to be done as salesman's morale was rapidly becoming impaired. Investigation disclosed that the real feeling in the field was that Green felt bigger than the industry of which he was a part and from which for years he had held himself more or less aloof. Emergency measures were taken to correct the situation and one year ago Green began his *first* trade paper advertising. He used big space and color consistently in *Electrical Merchandising*.

In this short time Green has nearly regained his old place, dealer good will of an enviable quality has been established, his salesman are on their feet . . . which signifies that the helpful "they" are now at last working for and not against him.

**Business name is assumed identity.*

MORAL: In selling, as in warfare, the best defense is a strong offense—and the dealer organization, which is the artillery force, must be reduced with as well as the infantry.

McGRAW-HILL PUBLICATIONS

New York Chicago Cleveland Detroit Philadelphia St. Louis
Cincinnati San Francisco Boston London



ALL-AMERICAN AIRCRAFT SHOW

Detroit City Airport and Hangar

APRIL 5-13, 1930

Weapons of
Aircraft Bureau
Detroit Board of Commerce

Approved by
Aeronautical Chamber of Commerce
of America, Incorporated

The 1930 All-American Aircraft Show at Detroit promises to be the greatest event of its kind in the history of aviation. With the entire City Airport given over to the exposition—exhibits housed in the municipal hangar containing 200,000 square feet of floor space and demonstrations given from the flying field—the 1930 All-American Show offers manufacturers an unusual opportunity to place their ships and accessories before a vast and un-mindful public.

At the 1929 All-American Show 58 manufacturers exhibited 102 ships at Convention Hall, while 141 manufacturers of accessories participated. From advance reservations for 1930 it is apparent that the exhibits will be greater still, both in the number of manufacturers represented and the number and variety of aircraft shown. Drawings for space are to be made during the Cleveland Aeronautical Exposition.

For full particulars apply to
RAY COOPER, Manager

Suite 5022 Cleveland Hotel
AUG. 24-SEPT. 2

The Official Navy Tests at Lakehurst Proved

FLOYD SMITH SAFETY PACK

FAR SUPERIOR TO ALL OTHER
MAKES OF PARACHUTES USED

Out of nine test drops made by navy officials from balloons and 1 drop from one foot to 1500 feet, the Floyd Smith Safety Pack averaged 40% of a normal quarter opening time drop with a total gain of 3-4-5 seconds.

The system is so simple, so elastic, so light, so strong—yet still solid pack, with one new valve adjustment—the system is quick and sure for "Smiley" (Coming Down) for full information.

Specialist in every aspect of parachute theory. Let us tell you our story and manufacturing plan.

Switlik Manufacturing Company

Factory: Trenton, N. J.

Sales Office: 300 City Centre Bldg., Philadelphia, Pa.

MAKING GOOD TANKS BETTER

WHEN THE U. S. NAVY BUILDS fighting planes, it insists on perfect tanks ... tested to guarantee strength, durability, safety.

For years, Paramount tanks have been standard for many Navy planes. Navy tests are applied by Paramount Navy-standard equipment in the large, modern Paramount plant.

The superiority of all Paramount tanks is due in large part to the wealth of experience gained in making better tanks perfect for Navy use.

Paramount Tanks designed for tomorrow use may also be standardized in Navy requirements. Write for details.

PARAMOUNT
WELDED ALUMINUM PRODUCTS CORP.
185 BROOKMAN AVE. BROOKLYN 3, N. Y.
"Paramount Tanks Are Better"



The perfection of these Paramount-built engine fuel and oil tanks is demonstrated in this Navy-standard rotating crank. 3,600 checks per minute are applied for twenty-five hours without developing the slightest leak or flaw.

PROPELLER-IZE



of Proven Quality

Endorsed By Leading Aircraft
Industries

Aero Corp. of Cal.
American Back Corp.
Alexander Aircraft Corp.
Bach Aircraft Corp.
Cessna Monoplane Corp.
Crown Aircraft Corp.
Federal Aircraft Corp.
Fleet Aircraft Co.
Hawlow Aircraft Corp.
Titan Aircraft Corp.
Kearney Engine Co.
Kinner Motor Corp.
Mitsubishi Motors Co.

Years of Continuous Service have conclusively demonstrated

THE SUPERIOR QUALITY of STORY CUSTOM BUILT PROPELLERS

Maintaining their original performance along with exceptional DURABILITY and LOW UPKEEP
SPECIFY STORY PROPELLER
Equipment in the future

THE STORY-GAWLEY CO.
1540 N. San Fernando Road
GLENDALE, CALIFORNIA
Phone Douglas 209

BRANCHES
Wheeler Aircraft, Whittier, Calif. Inc.
Climax Commercial Building, San Antonio, California
Cable Address: Storyprop



CAVALIER

The dawn of a new day ... Sales possibilities, comparable to the maximum popular price field in the aviation industry, have been opened for a reason by the "Cavalier"—a sturdy, lightweight, acrobatically equipped, two-place cabin monoplane—which delivers precise performance at extremely low cost and operating cost ... The "Cavalier," with Vee 16-5 or 18-1600 engine, delivers, complete for flying, at \$2985. Wright Gyro supplied on purchaser's option, at slight additional cost. ... The "Cavalier" is in production and strongly financed. Aggressive dealers are wanted for eastern areas not yet filled. Write us now for details of superior performance and construction, giving references and proof of sales ability.

Approved Type Certificate No. 128

Star Aircraft Co.

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